SITE INVESTIGATION REPORT

LEAD PRODUCTS CO., INC.
HOUSTON, TEXAS
VCP NO. 334

Prepared for

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SECTION 1
INTRODUCTION

1.1 OVERVIEW

This report has been prepared to present a summary of site investigation activities that have been completed to evaluate the extent of surface soils, subsurface soils, and groundwater impacted by historical placement of battery casing fill material at the Lead Products Company, Inc. (LPCO) facility located at 709 North Velasco Road in Houston, Texas. The descriptions and discussions presented in this document are primarily based on activities completed by ENSR Consulting and Engineering (ENSR) from February 1985 through September 1991 and Roy F. Weston, Inc. (WESTON®) from December 1993 through June 1998. In addition, information obtained from investigation reports completed by other consultants for adjacent properties is also included in this report.

1.2 SITE LOCATION AND DESCRIPTION

The LPCO site is located near downtown Houston, east of the central business district. The site is situated in an industrial area and consists of a large building housing an office and work space, four smaller buildings used for storage and work space, asphalt and concrete paving, and a couple of concrete slabs. In addition, a large drainage ditch originates in the west-central portion of the LPCO property, between the site and the Houston Central Industries (HCI) property. This ditch continues northward adjacent to the former Childs Truck Equipment (Childs) and City of Houston properties, eventually discharging into Buffalo Bayou. A Site Map is provided as Figure 1-1.

The drainage ditch property was purchased by LPCO in 1995 and the former Childs property was purchased by LPCO in late 1998.

1.3 SITE BACKGROUND

LPCO began operations at the site in the 1930s. Until approximately the mid-1960s, these operations consisted of reclaiming lead from discarded materials (primarily batteries). By-products of this process included battery casings containing residual lead. These casings were subsequently crushed and used as fill material along with imported soil and rubble.

Fill material was placed at the Lead Products site and certain adjacent properties for leveling, backfilling, and construction purposes. Specifically, some of the fill material was placed on the KQUE/KNUZ transmitter property, along the drainage ditch, on the back of the former Childs property, and on a small area in the southwest corner of the City of Houston property.

The fill material is predominantly comprised of crushed battery casings mixed with concrete rubble, reworked clay, sand, wood debris, rebar, and wire fragments. The fill is shallowest on the south and east side of the Lead Products property and becomes progressively thicker (approaching 10 feet) approaching the drainage ditch.

It should be noted that the presence of fill materials on the KQUE/KNUZ property is being addressed separately by the owner of the KQUE/KNUZ property. Although the battery casing fill materials situated on a small area of the City of Houston property are addressed as part of this investigation, the remaining portions of the City of Houston property will not be addressed due to the presence of high concentrations of lead in the ash piles originating from historical operation of an incinerator on this property by the City of Houston.

1.4 REPORT FORMAT

This report has been divided into five sections. The remaining sections include the following:

- Section 2—Field Activities
- Section 3—Site Characterization
- Section 4—Conclusions and Recommendations
- Section 5—References

Figures referenced in the text of this report are located at the end of each section, unless otherwise noted. In addition, all directions referred to throughout the text are based on "site north" as illustrated on the figures included within the text.

SECTION 2
FIELD ACTIVITIES

On behalf of LPCO, several investigations have been completed at the site and in the vicinity of the site by ENSR and by WESTON. In addition, SWL Environmental Services (SWL), Camp Dresser & McKee (CDM), and Reservoirs Environmental Services, Inc. (RES) have completed several investigations in the vicinity of the site on behalf of the City of Houston. The activities completed by each of these companies during the investigations are summarized in the following subsections.

Unless otherwise noted, all samples were analyzed for total lead. The sample stations are illustrated on Figure 2-1.

2.1 ENSR

The investigations completed by ENSR, which occurred between February 1985 and December 1990, are discussed in the following sections [ENSR, December 1990]. The purpose of the investigations completed up to January 1989 was to evaluate if residual lead in the battery casing fill had leached into the soils underlying the site. The objectives of the investigation completed from October to December 1990 were as follows:

- Evaluate lead background levels in soils in the site area;
- Evaluate the horizontal and vertical extent of surface soil lead contamination (on- and off-site);
- Evaluate if residual lead from the battery casing fill had migrated into the shallow water-bearing zone underlying the site; and
- Collect additional information.

For informational purposes, excerpts of the ENSR Report, including ENSR Figures 3-1 and 3-2 illustrating their sampling stations and ENSR Tables 3-1 through 3-6 summarizing the analytical results, are provided in Appendix A.

2.1.1 Site Investigation – 28 February 1985 Through 1 March 1985

A total of 36 soil samples were collected from 12 locations (TP1 through TP12) situated in the south-central portion of the site during field activities conducted from 28 February 1985 through 1 March 1985. Three samples were collected from each location: surface, 2 feet below ground surface (bgs), and 4 feet bgs. The samples collected at depth were obtained after the completion of a test pit at each location.

It should be noted that these sample stations were originally identified by ENSR as "1" through "12". To avoid confusion between the station identification and corresponding analytical result, the stations were re-labeled by WESTON as TP1 through TP12 on Figure 2-1.

2.1.2 Site Investigation - 25 March 1985 Through 18 April 1985

A total of 25 samples were collected along the west and east banks of the drainage ditch. Surface soil samples were collected from stations LPD-1 through LPD-9. In addition, 16 soil samples (one at the surface and one at 1.5 feet bgs) were collected at stations D-1 through D-8. It should be noted that the locations of stations LPD-7 through LPD-9 were not shown on the ENSR maps, and consequently, these stations are not shown on Figure 2-1.

A total of 44 soil samples were collected from 16 test pits (locations shown as LPTP-1 through LPTP-16 on Figure 2-1). These test pits were completed at 15 on-site locations and one location (LPTP-10) on the former Childs property. In general, three samples were collected from each test pit: one from the surface, one from the native soil underlying battery casings (if present), and one at the approximate midpoint between the surface and undisturbed soil. Only two samples were collected from the test pits completed at locations LPTP-11, LPTP-12, LPTP-14, and LPTP-15.

In addition to soil sampling, surface water samples were collected from the ditch at stations D5-WS-1 and D8-WS-1.

2.1.3 Site Investigation - 24 August 1988

A total of 22 sediment/soil samples were collected from 11 sampling stations (DS-1 through DS-11) located adjacent to the center of the ditch and along the top of the east bank of the ditch. Two samples were collected at each station, one at surface and one at 1-foot bgs. Station DS-4 was not shown on the ENSR figures, and consequently, this station is not shown on Figure 2-1. The analytical results for samples from this location are not included in ENSR Table 3-1.

2.1.4 Site Investigation - 21 December 1988

A total of 20 soil samples were collected from ten test pits [locations shown as (ENSR)1 through (ENSR)10 on Figure 2-1] completed in the southwest corner on the City of Houston property. Two soil samples were collected from each test pit: one at 1-foot below the extent of the battery casings, and one at 2-feet below the extent of the battery casings. ENSR referred to these test pit locations as "00 through 08 and 10" in the text and analytical summary tables of their report, but illustrated these stations as "01 through 10" on their figure [ENSR, December 1990]. For the purpose of this report, WESTON has assumed that the data reported

by ENSR for locations 00 through 08 and 10 coincides with stations 01 through 10, respectively.

Since these sample stations were originally identified by ENSR as "01" through "10", the stations were re-labeled by WESTON as (ENSR)1 through (ENSR)10 to minimize confusion.

2.1.5 Site Investigation - 6 January 1989

A total of four surface soil samples were collected from four stations (NSD-1 through NSD-4) located along the west bank of the drainage ditch. In addition, one water sample (DW-1) was collected from ponding water in the ditch.

2.1.6 Site Investigation - October through December 1990

2.1.6.1 Background Soils

A total of seven surface soil samples were collected from off-site areas to establish background concentrations of lead in soils in the site area on 16 November 1990. These samples were collected from two locations on the City of Houston property (COH-1-BKG and COH-2-BKG), four locations on the former Childs property (Childs 1-BKG through Childs 4-BKG), and one location at a near-by play area located near the intersection of Fox Street and Middle Street (BKG-PARK). The locations of these stations are shown on Figure 2-1, except for the sample collected from the play area.

Following collection of the four samples from the former Childs property, it was determined that crushed battery casings had been placed as fill material on the former Childs property. Consequently, these samples were not used as background locations, but were instead used to delineate soil impact.

2.1.6.2 Surface Soils

A total of seven surface soil samples were collected from three stations located in the southeast corner of the site (B-1 through B-3) and four stations located in the southern portion of the drainage ditch (B-4 through B-7). Samples B-1 through B-3 were collected on 8 October 1990 and analyzed for total lead and toxicity characteristic leaching potential (TCLP) lead, and samples B-4 through B-7 were collected on 14 November 1990 and analyzed for total lead.

2.1.6.3 Subsurface Soils

A total of 12 borings were completed to depths of approximately 20 feet bgs to characterize the shallow stratigraphy and delineate the vertical extent of lead contamination in the subsurface soils. Eight borings [(LP)B-1 through (LP)B-3, (LP)B-8, and (LP)MW-1 through (LP)MW-4] were completed on-site, two borings (Childs B-4 and Childs B-5) were completed on the former Childs property, and two borings (COH B-6 and COH B-7) were completed on the City

of Houston property. All of the samples collected from these borings were analyzed for total and TCLP lead. Lithologic logs completed by ENSR for these borings are provided in Appendix B.

2.1.6.4 Groundwater

Four monitor wells [(LP)MW-1 through (LP)MW-4] were installed on-site at the soil boring locations identified in the previous section. These wells were screened to depths of approximately 18 to 21 feet. Groundwater samples were collected from each well and submitted for laboratory analyses, including total and dissolved lead, chlorides, and sulfate.

2.2 SWL ENVIRONMENTAL SERVICES (SWL)

SWL was retained by the City of Houston to perform a limited subsurface investigation at the proposed Ball Street extension [SWL, April 1993]. Generally, the objective of this investigation was to evaluate the horizontal and vertical extent of the lead-impacted soils. Soil borings were completed at 12 locations [(SWL)SB-1 through (SWL)SB-12] along proposed Ball Street to depths of approximately 10 feet bgs. In addition, hand auger borings were completed at eight locations (HA-1 through HA-8) to depths of approximately 4 feet bgs along the east and west banks of the drainage ditch. All samples were analyzed for total and TCLP lead. For informational purposes, excerpts of the SWL Report, including their soil boring logs, analytical summary table and sample location map, have been provided in Appendix C.

2.3 CAMP DRESSER & MCKEE, INC. (CDM)

CDM completed a Phase II environmental assessment for the City of Houston as part of the proposed expansion of the North Velasco Street Lift Station [CDM, February 1996]. The purpose of this assessment was to determine the presence or absence of impact, if any, along the proposed sewer route that may be associated with LPCO. As part of this assessment, soil borings were completed at six locations (EB-1 through EB-6) to depths of approximately 25 feet bgs. On average, six samples were collected at varying depths at each boring. Samples were analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. For informational purposes, excerpts of the CDM Report, including an analytical summary table and sample location map, have been provided as Appendix D.

2.4 RESERVOIRS ENVIRONMENTAL SERVICES, INC. (RES)

RES was retained by the City of Houston to complete an investigation to assess asbestos, lead, and potentially hazardous waste containing materials and soils associated with the former Velasco Incinerator located on the City of Houston property [RES, May 1996]. The purpose of this investigation was to determine the presence of accessible and/or exposed asbestos and lead containing building materials and soils and ash potentially contaminated by the former Velasco Incinerator facility. The following samples were collected and analyzed as part of this investigation:

- A total of 18 bulk samples suspected of containing asbestos (ASB-01 through ASB-18) were collected and analyzed for asbestos.
- A total of 36 soil and debris samples in areas adjacent to the buildings (Soil-01 through Soil-18, Soil-19D through Soil-30D, and Soil-31 through Soil-36) were collected and analyzed for total lead.
- Nine paint samples (Pb-01 through Pb-09) were collected from inside the main incinerator building and analyzed for total lead.
- Six ash samples (ASH-01 through ASH-06) were collected from inside the north and south incinerators and analyzed for total lead.

All of the soil and debris samples were collected at depths less than 1-foot bgs and analyzed for total lead. In addition, 18 of the soil, ash, and debris samples were also analyzed for TCLP Resource Conservation Recovery Act (RCRA) metals.

For informational purposes, excerpts from the RES Report, including an analytical summary tables and sample maps, have been provided in Appendix E.

2.5 ROY F. WESTON, INC. (WESTON)

WESTON was retained by LPCO in December 1993 to assist LPCO in further defining the extent of lead-affected soils on-site and in the vicinity of the site, and to perform groundwater monitoring activities. To accomplish this, two investigations were conducted: one to further delineate soil contamination at the adjacent former Childs property, and one to further characterize the lead-affected soils on-site, on the adjacent HCI property, and on the nearby City of Houston property. In addition, WESTON performed a total of seven groundwater-sampling events between February 1996 and December 1998.

It should also be noted that several field activities were completed, by WESTON on behalf of LPCO, at the request of the U.S. Environmental Protection Agency (EPA) in the vicinity of Cary Street area. This area consists of a residential neighborhood adjacent to Cary Street and near the LPCO facility. The primary purpose of these activities was to evaluate the extent of elevated lead concentrations in surface soils on properties located in the Cary Street area.

The investigations and groundwater sampling events completed by WESTON are discussed in the following sections.

2.5.1 Childs Property Investigation

WESTON completed soil borings at six locations (GP01 through GP06) on the former Childs property on 26 November 1996. All of the borings were completed to depths of at least 20 feet bgs. Two soil samples were collected from each boring, one from the surface and the other at depth (ranging from 17 feet to 21 feet bgs). All of the soil samples were submitted for

volatile organic compound (VOC) and RCRA metals analyses. WESTON attempted to collect groundwater samples from each boring, but no recoverable water was observed in the boring which would permit the collection of any samples.

2.5.2 Site Characterization Activities

WESTON performed field activities from 8 to 15 June 1998 in general accordance with the Site Characterization Work Plan, dated May 1998 [WESTON, May 1998]. The purpose of these activities was to further define the extent of affected surface soils, subsurface soils, and groundwater related to historical operating practices at the facility. The field activities performed during this investigation are discussed further in the following subsections.

2.5.2.1 Soil Sampling

Surface and subsurface soil samples were collected from two locations on-site (SB02 and SB04). These samples were submitted for VOC, semi-volatile organic compound (SVOC), polychlorinated biphenyls (PCBs), and total RCRA metals (including antimony, cobalt, nickel, and zinc) analyses.

To better define the extent of off-site surficial lead contamination, surface soil samples were collected at five locations at the HCI property (SB05 through SB08 and SB11). The samples were submitted for laboratory analysis for total RCRA metals (including antimony, cobalt, nickel, and zinc).

In order to evaluate the background concentrations of lead soils adjacent to the site area, surface soil samples were collected at five off-site locations (SS-01 through SS-05) believed to be unaffected by historical site operations. Background samples were submitted for total RCRA metals analyses including antimony, cobalt, nickel, and zinc.

2.5.2.2 Geoprobe Borings

Geoprobe borings were completed at 10 locations during this investigation. Four of these borings (SB01 through SB04) were located on-site, four borings (SB05 through SB08) were located on the HCI property, and two borings (SB09 and SB10) were located on the nearby property owned by City of Houston.

2.5.2.3 Monitor Well Installation and Sampling

To better evaluate the extent of the affected groundwater, three monitor wells were installed during this investigation. Wells were placed at the south corner of the LPCO property [(LP)MW-5], near the former incinerator on the City of Houston property [(COH)MW-1], and across the drainage ditch on the HCI property [(HCI)MW-1]. Wells were completed to approximately 20 feet bgs.

Following the development of monitor wells (LP)MW-5 and (HCI)MW-1, the wells were purged and sampled in general accordance with "Low-flow (Minimal Drawdown) Groundwater Sampling Procedures" by Robert W. Puls and Michael J. Barcelona (EPA/540/S-95/504), April 1996. Groundwater samples were collected and submitted for RCRA metals (including, antimony, cobalt, nickel, and zinc) analysis. One sample from each well was filtered with a 10-micron filter during sample collection. The well placed at the City of Houston property [(COH)MW-1] failed to produce water at the time of well development, and consequently, this well was not developed, purged, or sampled.

2.5.2.4 Slug Test

In order to evaluate the hydraulic properties of the shallow water-bearing unit beneath the LPCO site, a slug test was conducted in four monitor wells [(HCI)MW-1, (LP)MW-2, (LP)MW-3, and (LP)MW-5]. The tests were performed by producing an artificial change in the water level in the well and monitoring the subsequent equilibration to the original static level. This was accomplished by lowering a solid PVC displacement rod (slug) of known volume into the water to raise the water level (slug-in test), and by removing the slug from the well to lower the water level (slug-out test).

Both slug-in and slug-out tests were conducted. Prior to testing, static water levels were recorded. A decontaminated pressure transducer connected to a datalogger was then lowered into the well to no more than 10 feet below the static water level. A slug was then lowered into the well to raise the water level. At the same time, the datalogger recorded water level changes in the well until equilibration. After equilibration, the slug was removed and the rising head test initiated. These data were also recorded on the datalogger. Upon completion of each test, the transducer, transducer cable, and slug were thoroughly decontaminated by washing with potable water and Liquinox followed by rinsing with deionized water.

Upon completion of all the slug tests, data from the datalogger was downloaded into a computer software program for interpretation and analysis. The results of this data analysis are provided in Appendix F.

2.5.2.5 Well Capacity Test

A well capacity test was performed to evaluate whether the shallow water-bearing zone is capable of producing "usable" quantities of groundwater. In the event that the water-bearing zone cannot produce more than 150 gallons per day (approximately 0.1 gallons per minute), under current Texas Natural Resource Conservation Commission (TNRCC) policy, a factor of 100 could be applied to the groundwater protection standard to establish default cleanup values.

To perform this test, a submersible pump was placed in Monitor Well (LP)MW-5 to a depth of approximately 4 feet below the top of water. A decontaminated pressure transducer was placed at 1.5 feet below the top of water to monitor drawdown during the test. Initially, water

downstream. The study indicated that the on-site soils are classified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) as non-hydric (non-wetland) soils. A National Wetland Inventory Map identifies the ditch as a artificial, semipermanent, tidally influenced body of water. In addition, the bottom of the ditch contained very little vegetation due to scour created by a high volume and velocity of water during periods of runoff. The study concluded by stating that the ditch (with respect to the portion assessed as part of this study) contained no jurisdictional wetlands.

SECTION 3
SITE CHARACTERIZATION

3.1 SITE STRATIGRAPHY

3.1.1 Geology

The topography of the site area is flat to moderately sloping. Based on the investigations completed at and near the site, four stratigraphic units have been identified in the upper 20 feet beneath the site. Starting from the surface, these stratigraphic units include fill material, upper clay, silty sand, and a lower clay. Stratigraphic cross-sections have been created illustrating the relationship between these units (see Figures 3-1 and 3-2).

The fill material was placed on-site and in surrounding areas for leveling, backfilling, and construction purposes. The fill materials are typically comprised of crushed battery casings co-mingled with concrete rubble, reworked clay, sand, wood debris, rebar, and wire fragments. The thickness of this unit varies from approximately 1 foot in several areas up to 10 feet in the area of station LPTP-12. The upper clay unit separates the fill materials from the underlying silty sand (or shallow water-bearing zone). The upper clay unit typically begins from the surface to a depth of 9 feet bgs and ranges in thickness up to 14 feet. The silty sand unit (comprising the shallow water-bearing zone) is located between two clay layers. This zone generally begins from 8 to 16 feet bgs, and ranges in thickness between 3.5 to 8 feet. A lower clay layer underlies the shallow water-bearing zone. This unit generally begins approximately 15 feet bgs, and appears to be at least 3 feet thick. The bottom depth of this unit has not been identified since data is limited to a depth of approximately 20 feet bgs.

3.1.2 Hydrogeology

Shallow groundwater at the site is present in the silty sand unit described above and is typically encountered at a depth of 10 to 15 feet below ground surface. The lower clay unit appears to act as a lower confining layer to this shallow water-bearing zone. The saturated thickness of this unconfined water-bearing zone is generally less than 2 to 3 feet and groundwater has only been observed once in monitor well (COH)MW-1. The shallow groundwater generally appears to exist under unconfined conditions.

Based on water level monitoring concurrently conducted by WESTON in February 1999, groundwater appears to be flowing to the north. The hydraulic gradient at the site ranges from 0.008 over most of the LPCO property to 0.03 on the former Childs property. A potentiometric map illustrating the water level measurements and flow direction is provided as

Figure 3-3. Field measurements supporting the water table elevation measurements are summarized in Table I-1 in Appendix I.

As previously discussed, slug tests were completed in four monitor wells [(HCI)MW-1, (LP)MW-2, (LP)MW-3, and (LP)MW-5] and a well capacity test was completed in monitor well (LP)MW-5. Slug test data were subsequently evaluated using the method described by Bouwer and Rice (1976). The Bouwer and Rice technique was selected because of its suitability for analysis of unconfined aquifers. Hydraulic conductivity (based on "slug-out" data) ranged from 9.87×10^{-4} to 9.49×10^{-3} centimeters per second (cm/sec) for the shallow water-bearing unit. Based on this range of hydraulic conductivity, a hydraulic gradient of 0.008, and assuming an effective porosity of 0.20, a seepage velocity ranging from 0.11 to 1.08 feet per day for the site has been calculated. The graphical representations for the hydraulic conductivity, field data used to calculate the average hydraulic conductivity and the seepage velocity calculation are provided in Appendix F.

In September 1997, Environmental Strategies Corporation (ESC) submitted a Site Investigation Report Addendum relating to the adjacent KQUE/KNUZ transmitter site (VCP No.498) [ESC, September 1997]. ESC collected a sample of the clay from the lower confining layer beneath the fill material and submitted it for permeability testing. The results of this test indicated that this clay has a vertical hydraulic conductivity of 3.1×10^{-9} cm/sec and that there were no sand lenses or macrofissures observed in the sample. This data indicates that the lower confining layer would provide a barrier to downward migration of groundwater from the shallow water-bearing zone.

3.2 BACKGROUND LEAD CONCENTRATIONS IN SOILS

As previously discussed in Section 2, numerous samples have been collected from areas in the vicinity of the LPCO site to evaluate lead concentrations in soils that do not appear to have been impacted by LPCO activities. These samples were collected during the 1990 ENSR investigation, WESTON field activities conducted in association with the Cary Street area in 1997, and WESTON's June 1998 Site Characterization activities.

ENSR collected three samples that appear unlikely to have been affected by historical LPCO activities. Three of these samples were collected on the City of Houston property and one sample was collected from a near-by play area located near the intersection of Fox and Middle Streets. The lead concentrations in these samples are presented in Appendix A and ranged from 18 to 230 mg/kg.

In May 1997, WESTON collected a total of 24 soil samples as part of the Cary Street assessment in areas unimpacted by historical LPCO operations. Lead concentrations in 22 of these samples were distributed fairly evenly between 5.49 and 242 mg/kg and the remaining two samples had lead concentrations of 2,180 and 2,230 mg/kg. This data is presented in Appendix G.

WESTON also collected five soil samples along North Velasco Road during the Site Characterization activities to further evaluate background conditions. These samples were collected in areas considered to be unaffected by LPCO operations. Lead concentrations in these soils samples ranged from 72.5 to 1,250 mg/kg. This data is presented in Appendix I.

The above data suggest that a number of anthropogenic sources exist for lead in the surface soils in the areas around the LPCO site. Due to the wide variability in these concentrations, a statistical analysis was not performed to establish a background concentration. Instead, it is our intent that LPCO will address known soil lead concentrations on their property, as well as deposits of fill material located on adjacent properties. However, due to the difficulties in establishing specific sources of lead on the off-site properties and lack of any apparent connection to LPCO operations, LPCO does not plan to address off-site areas of lead contamination not specifically associated with accumulations of battery casings.

In 1997, ESC collected seven samples from the lower confining clay layer in areas not overlain by fill material. The lead concentrations in these samples ranged from 3.5 to 11.5 mg/kg. This is generally consistent with subsurface soil samples collected by ENSR from the LPCO site. Several samples were collected from the lower confining clay in areas where the overlying silty sand had no reported lead concentrations at a reporting limit of 5 mg/kg (Well No.'s (LP)MW-1, (LP)MW-3, (LP)MW-4, and borings LP-B-1, B-2, and B-8, Childs-B-4 and B-5, COH-B-6 and B-7). Concentrations in the these clay samples ranged from <5 mg/kg to 15 mg/kg. Based on the combined data from the ENSR and ESC samples, a calculation was performed to determine the Upper Tolerance Limit (UTL) for the 17 clay samples that appeared to be unimpacted by LPCO operations or any other anthropogenic sources. This statistical method is described in a draft internal Voluntary Cleanup Program (VCP) memorandum dated 6 August 1997 [TNRCC, August 1997]. The UTL calculated for this data set was 15.5 mg/kg. This number will be used to evaluate the vertical extent of impacted soil on the LPCO site.

3.3 DELINEATION OF LEAD-AFFECTED SOILS, BATTERY CASINGS, AND MISCELLANEOUS DEBRIS

Lead concentrations, as reported or obtained during the investigations discussed in Section 2, are presented on Figures 3-4 through 3-6. The data and corresponding figures are presented with respect to specific depth intervals. The sample depths have been subsequently categorized as follows: surface soils (depths less than 2 feet bgs) and subsurface soils (depths ranging from 2 to 5 feet bgs, and 5 to 10 feet bgs. Where more than one sample was collected and analyzed from a location within a specific depth range, the highest reported lead concentration has been placed on the figures. For discussion purposes, WESTON has identified areas (illustrated by contours on the above-referenced figures) where lead concentrations exceed the lead Risk Reduction Standard No. 2: Soil and Air Ingestion – Industrial (RRS#2 SAI-Ind) level of 1,000 milligrams per kilogram (mg/kg) and where lead concentrations have been reported in ranges exceeding 1% (10,000) mg/kg.

Figure 3-7 presents the depths at which soils samples demonstrate attainment of the calculated background concentration of 15.5 mg/kg

Analytical data corresponding to the samples collected by ENSR, SWL, CDM, and RES are provided in Appendices A, C, D, and E, respectively. Analytical data corresponding to samples collected by WESTON are presented in Tables H-2 through H-5 in Appendix I. Soil boring logs completed by WESTON are provided in Appendix J.

3.3.1 Surface Soils (Depths Less Than 2 Feet BGS)

Elevated lead concentrations in surface soils are illustrated on Figure 3-4. It appears that nearly the entire LPCO site (except for the areas covered by buildings) including the drainage ditch, the former Childs property, and the southeast corner of the City of Houston property have been impacted with lead most likely resulting from historical LPCO operations. Several localized areas within the LPCO property have surface soil lead concentrations ranging up to 14%, while the majority of the site appears to have lead concentrations in the 5% range.

3.3.2 Subsurface Soils (Depths Greater than 2 Feet BGS)

Elevated lead concentrations in subsurface soils are illustrated on Figures 3-5 and 3-6.

As shown on Figure 3-5 (depths from 2 to 5 feet bgs), it appears that four areas (three on the LPCO site and one on the northwest portion of the former Childs property) have been impacted with lead concentrations exceeding 1,000 mg/kg. Two of these areas on the LPCO property are localized and have lead concentrations ranging up to 4%.

As illustrated on Figure 3-6 (depths from 5 to 10 feet bgs), it appears that three areas (two on the LPCO property and one on the northwest portion of the former Childs property) have been impacted with lead concentrations exceeding 1,000 mg/kg. One isolated area has a lead concentration reported at 1.2%.

As indicated above, Figure 3-7 presents the depths at which soils samples demonstrate attainment of the calculated background concentration of 15.5 mg/kg. As shown on this figure, all of the soils in on-site areas meet the 15.5 mg/kg level at a depth of no greater than 19 feet. The deepest sample above 15.5 mg/kg in this boring was at 17.5 feet at a concentration of 34 mg/kg. This figure represents an overly conservative estimation of the depth of impact since the 15.5 mg/kg cutoff may actually be shallower than shown; however, samples were not always collected at the shallower intervals.

3.3.3 Battery Casing Fill Material

In addition to elevated lead concentrations, fill material containing battery casings has been observed at varying locations and depths on-site and off-site based on observations made while completing the soil borings and test pits during the field activities. As illustrated on Figure 3-

8, battery casings have been observed at depths ranging from 1 to 10 feet bgs. Casings have been observed at numerous locations on the LPCO property, as well as on the former Childs property, and the southwest portion of the City of Houston property.

It should be noted that no battery casings were observed during the field activities conducted as part of the Cary Street area investigation.

3.3.4 City of Houston Property

As previously discussed in Section 2.4, RES performed sampling activities at the City of Houston property, which is the location the former Velasco Incinerator facility. The facility once consisted of a main building that housed two incinerators and accompanying smokestacks that were demolished and removed from the property during 1998. In addition, several debris piles, consisting of soil, waste ash material, and construction debris, were observed during the RES investigation in areas surrounding the former building. This main building and associated stacks and debris piles were located just north of the former Childs property and have been demolished since these samples were collected.

A second incinerator building structure located approximately 500 feet north of the main building was also observed. This structure reportedly consisted of two brick, smoke stacks which were partially buried by debris and waste ash piles on all sides. The building associated with these smokestacks was no longer present.

Asbestos was documented in two of the 18 sampled materials as part of the asbestos survey. The materials included a cloth covering a fan motor and insulation material located within the secondary incinerator building.

Lead was reported in all of the nine samples collected as part of the paint survey. Reportedly, analyses of paint with results greater than 0.5% lead are considered lead-containing according to EPA regulations. Six of these samples contained lead concentrations above this threshold and ranged from 0.84% to 3.7% and one other sample contained a lead concentration of 0.32%.

Lead was reported in all of the 24 soil samples and 12 debris samples collected as part of the assessment. The samples were collected in areas encompassing the former incinerators. Lead concentrations in the soil samples ranged from 13.2 mg/kg to 4,921 mg/kg, with eight of the 24 samples having concentrations exceeding 1,000 mg/kg. Lead concentrations in the debris samples ranged from 46.7 mg/kg to approximately 1,800 mg/kg, with one of the 12 samples having a lead concentration exceeding 1,000 mg/kg. TCLP lead was reported in four of the six soil samples at concentrations ranging from 0.45 to 4.94 mg/L.

Lead was reported in all of the six ash samples collected as part of the assessment. Lead concentrations ranged from 2,480 mg/kg to 8,430 mg/kg. In addition, reported TCLP lead

levels in all six of these samples exceeded 5.0 mg/L, with concentrations ranging from 5.81 to 149 mg/L.

Based on these results, it appears that the presence of lead (as determined by the RES assessment) in the soils, debris, ash, and paint on the City of Houston property is a result of historical incinerator activities. The pattern of the lead concentrations in these soil samples did not suggest that either LPCO or the battery casing fill material was the source of the lead. WESTON is not aware of any studies that have been conducted to evaluate the influence the incinerator operations have had on distributing lead to the nearby areas.

3.4 CONSTITUENTS OTHER THAN LEAD IN SOIL

As previously mentioned in Section 2, samples were collected and analyzed for constituents other than lead during several investigations, including the City of Houston assessment completed by RES, and the Childs property investigation and LPCO Site Characterization completed by WESTON.

As part of the RES assessment, several (six soil, six debris, and six ash) samples were analyzed for TCLP RCRA metals in addition to total lead. In the four soil samples where TCLP lead exceed the detection limit (with concentrations ranging from 0.51 to 4.94 mg/L), TCLP arsenic was reported in one sample at 0.003 mg/L and TCLP barium was detected in all four samples with concentrations ranging from 2.4 to 3.0 mg/L. It should be noted that TCLP arsenic and barium were reported at similar concentrations in the two samples where TCLP lead was reported at concentrations below the detection limits.

As part of the Childs property investigation, all of the 14 soil samples collected were analyzed for total RCRA metals and VOCs. Barium and chromium were reported above the detection limits, in addition to lead, in all of the samples. Barium concentrations ranged from 44.84 to 189 mg/kg in surface samples and 2.10 to 32 mg/kg in subsurface samples. Chromium concentrations ranged from 4.37 to 17.14 mg/kg in surface samples and 0.87 to 4.84 mg/kg in subsurface samples. Cadmium was reported in two surface samples at 1.46 mg/kg and 0.56 mg/kg and appeared to be present only in soil samples with very high lead concentrations. Mercury was reported in six samples with concentrations ranging from 0.029 to 0.06 mg/kg. With respect to VOCs, carbon disulfide was reported in one surface sample at 5 μg/kg and methylene chloride was detected in four surface samples with concentrations ranging from 16 to 31 μg/kg. It should be noted that all of these concentrations are below the RRS#2 SAI-Ind levels for each respective constituent; however, four chromium results and two cadmium results exceed the default RRS#2 Groundwater Protection-Industrial (GWP-Ind) levels.

As part of the Site Characterization activities, all of the 15 soil samples (five background from off-site, four on the LPCO property, and six on the HCI property) collected were analyzed for total RCRA metals (plus zinc, antimony, arsenic, and mercury). In addition, two of the samples collected from the LPCO property were also analyzed for SVOCs, VOCs, and PCBs. Lead was the only constituent where concentrations were reported at levels greater than RRS#2

SAI-Ind, including: one background sample (as previously discussed in Section 3.2); two of the four samples collected on the LPCO property (23,500 mg/kg and 14,700 mg/kg); and three of the six samples collected from the HCI property (1,430 mg/kg, 1,570 mg/kg, and 10,700 mg/kg). Other than lead, several other constituents were reported at concentrations exceeding the default RRS#2 GWP-Ind levels, including:

- Barium—one sample from the LPCO property with a concentration of 5,290 mg/kg.
- Cadmium—three of the samples on the LPCO property and all six of the samples collected from the HCI property with concentrations ranging from 0.749 to 4.5 mg/kg.
- Chromium—two of samples on the LPCO property and three of samples collected from the HCI property with concentrations ranging from 11.7 to 22.4 mg/kg.
- Antimony—three of the samples on the LPCO property and four of the samples on the HCI property with concentrations ranging from 2.27 to 23.8 mg/kg.
- Arsenic—one of the samples on the LPCO property at a concentration of 50.5 mg/kg.
- Mercury—two of the samples on the HCI property at concentrations of 0.345 and 2.49 mg/kg.

3.5 LEAD-AFFECTED GROUNDWATER

As previously discussed in Section 2.5.3, WESTON has conducted seven groundwater-sampling events at the LPCO site since February 1996. In addition, two of the three new wells installed during the site characterization activities have been sampled. The total and dissolved (or filtered) lead results are summarized in Table I-5 in Appendix I, and are illustrated on Figures 3-9 through 3-14 for each monitor well.

The presence of lead-affected groundwater exceeding the RRS#2 Groundwater Protection (GP) level of 0.015 mg/L has been observed in Monitor Well (LP)MW-2 for every sampling event, with lead concentrations ranging from 0.91 to 1.97 mg/L. It should be noted that this well is situated in an area where fill material has been observed at its greatest thickness. The approximate delineation of lead-affected groundwater is illustrated on Figure 3-15.

Lead has also been reported at concentrations exceeding 0.015 mg/L during three sampling events in (LP)MW-3, with concentrations ranging from 0.018 to 0.07 mg/L, and one sampling event in (LP)MW-4, with a lead concentration reported at 0.027 mg/L. Lead has never been reported at concentrations above the detection limits (which have included 0.02 mg/L and 0.002 mg/L) in (LP)MW-1. Lead was not reported in samples from wells (LP)MW-5 or (HCI)MW-1.

Based on these results, it appears that although lead has been reported in groundwater at the LPCO site, the concentrations have been consistent and relatively unchanged throughout the sampling period. Although lead has been reported consistently in samples collected from (LP)MW-2, which is located in an area on the LPCO property where fill materials have been

observed in the greatest thicknesses, lead in the fill material at the site does not appear to increasing the lead concentrations in the shallow groundwater and the lead does not appear to be migrating.

has increased it by > 100 x MCL will continue to do so.

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FIGURE 3-9
LEAD LEVELS IN (LP)MW-1

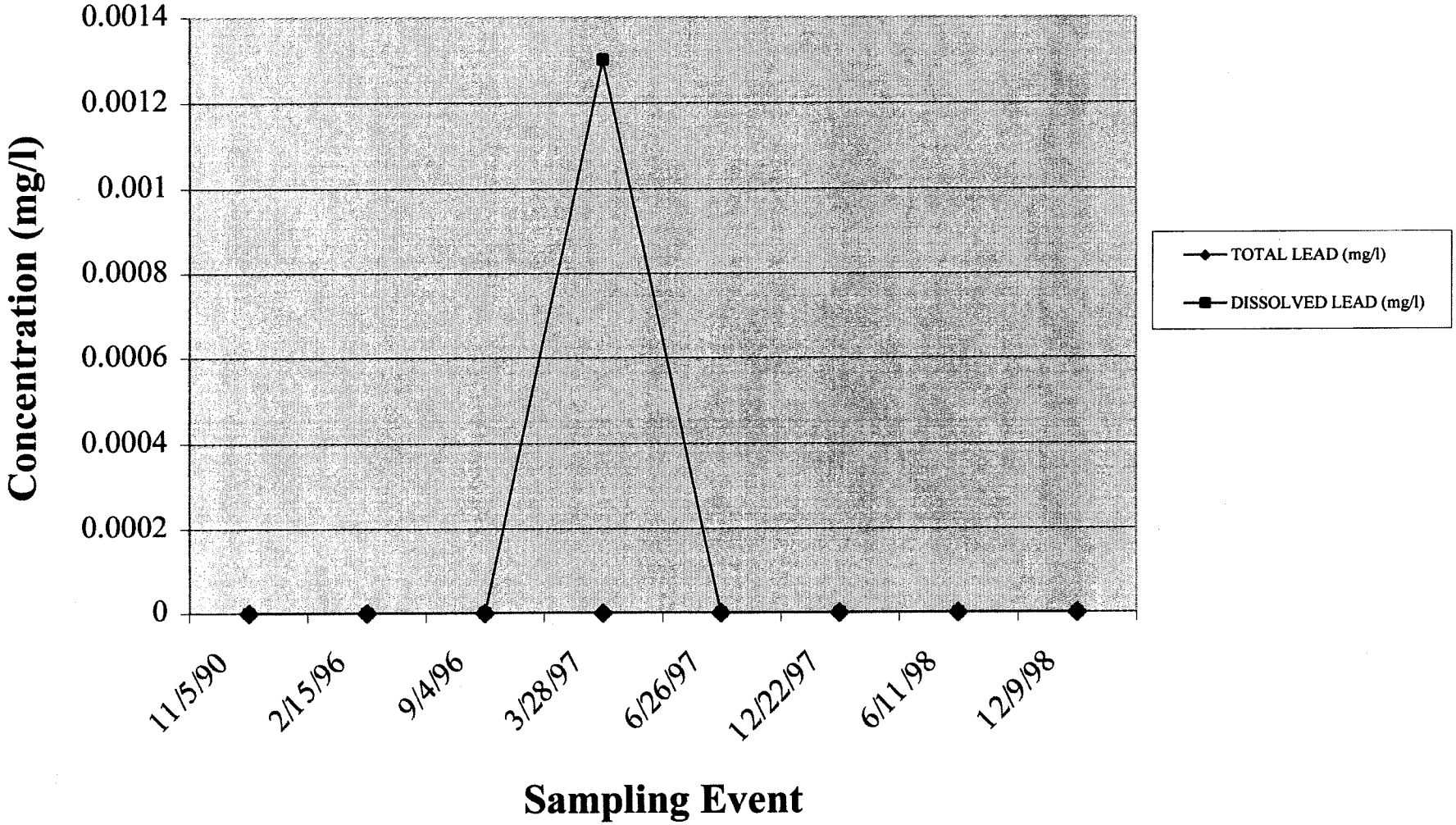


FIGURE 3-10
LEAD LEVELS IN (LP)MW-2

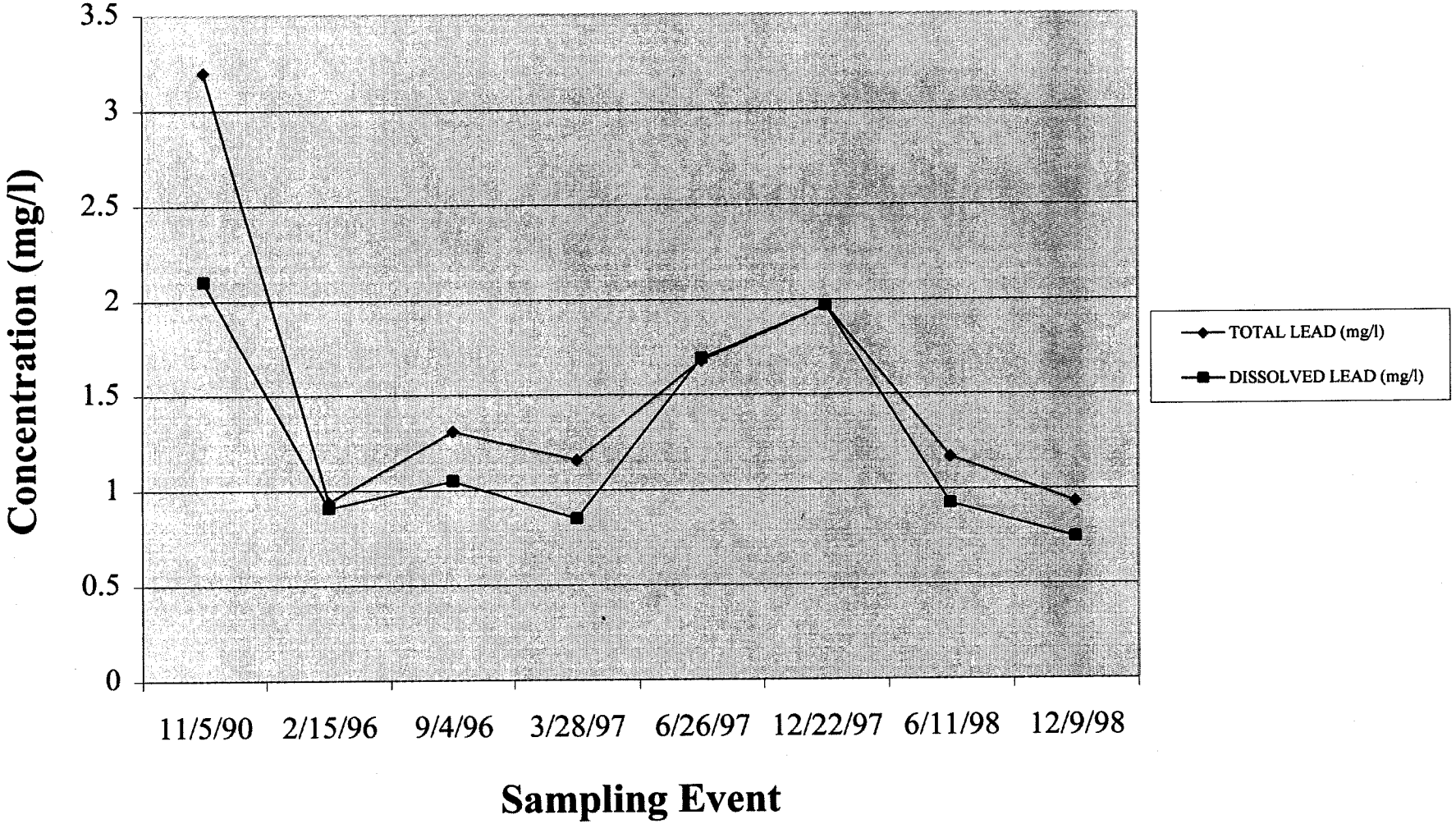


FIGURE 3-11
LEAD LEVELS IN (LP)MW-3

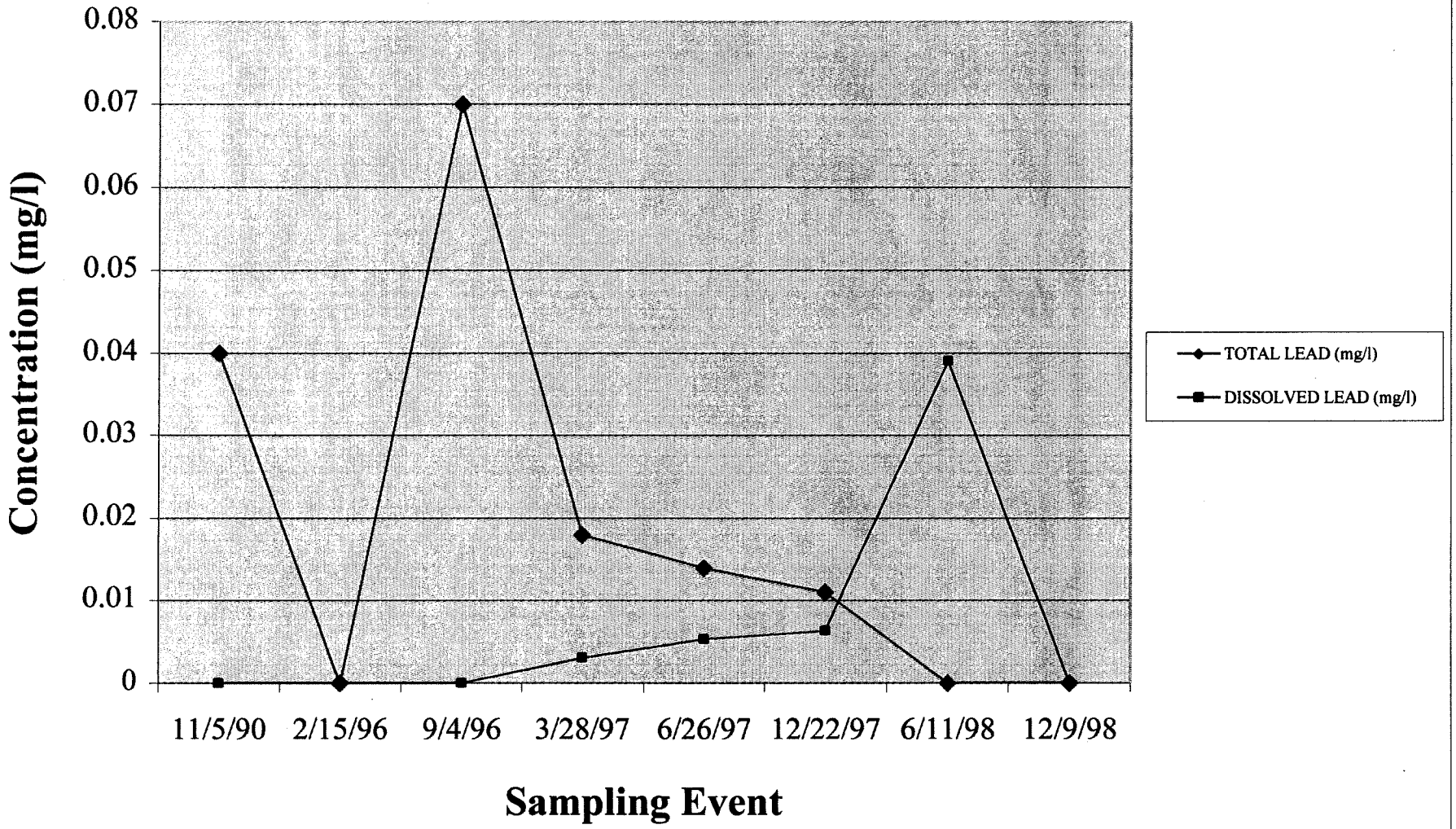


FIGURE 3-12
LEAD LEVELS IN (LP)MW-4

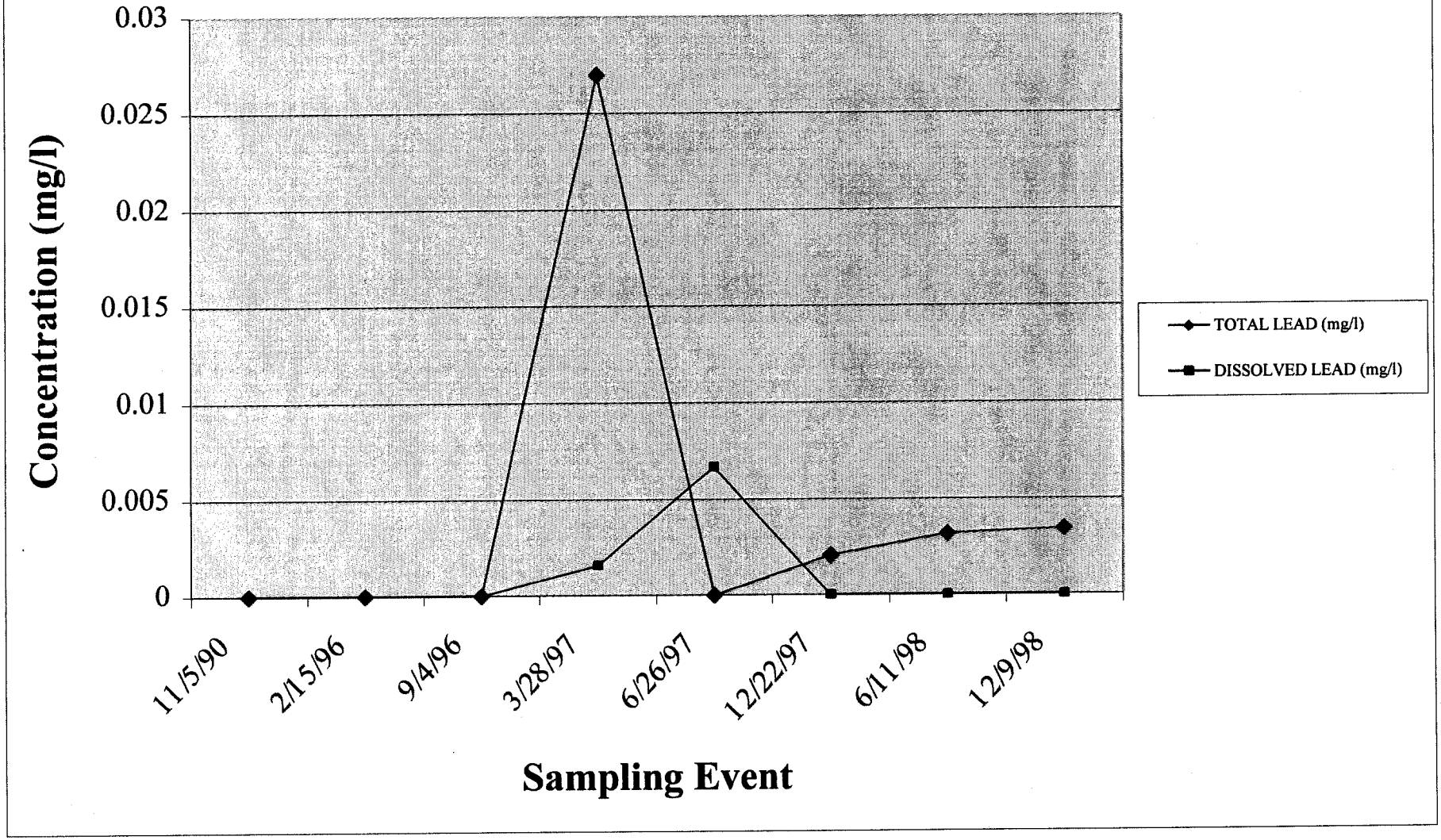


FIGURE 3-13
LEAD LEVELS IN (LP)MW-5

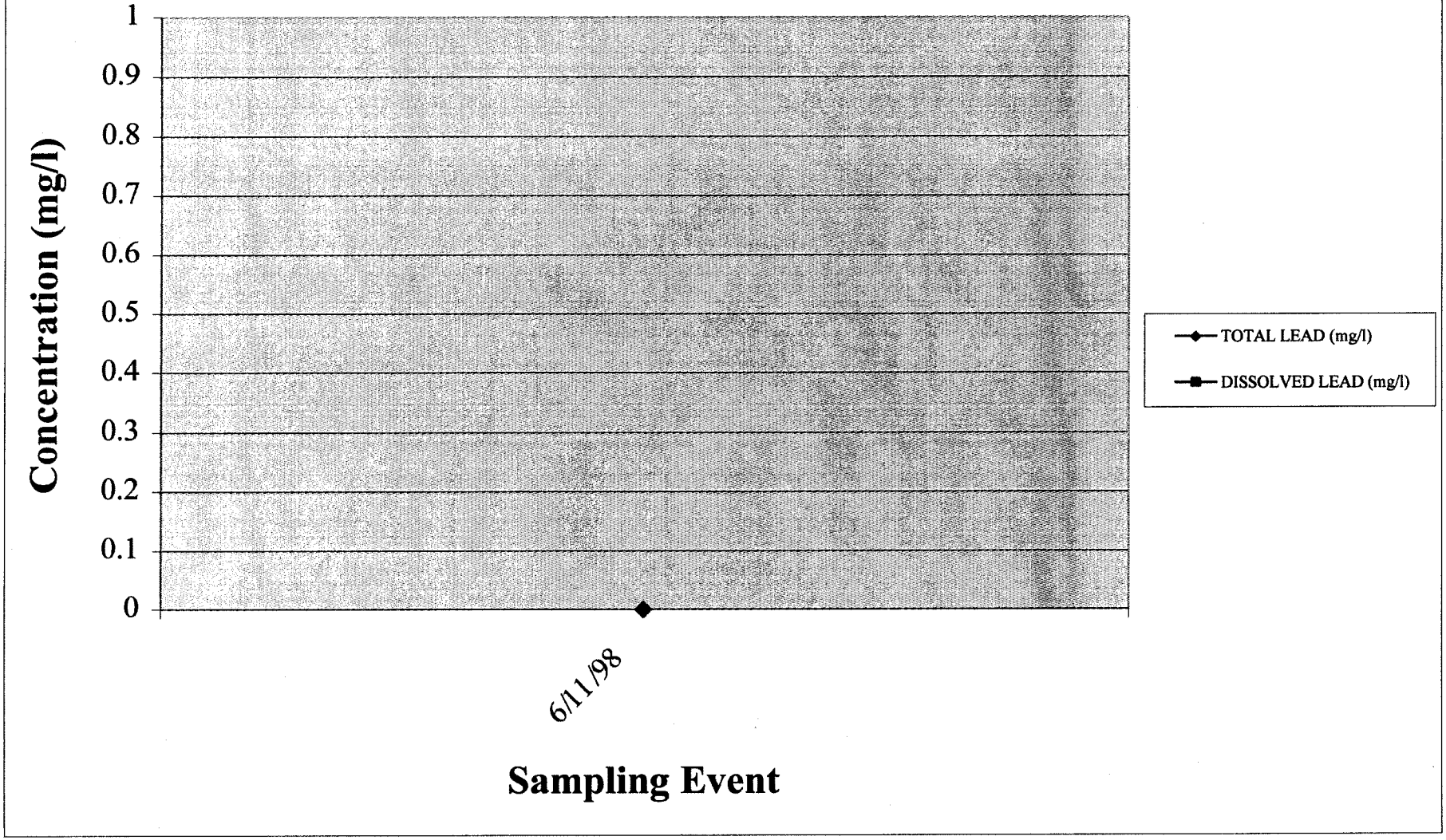
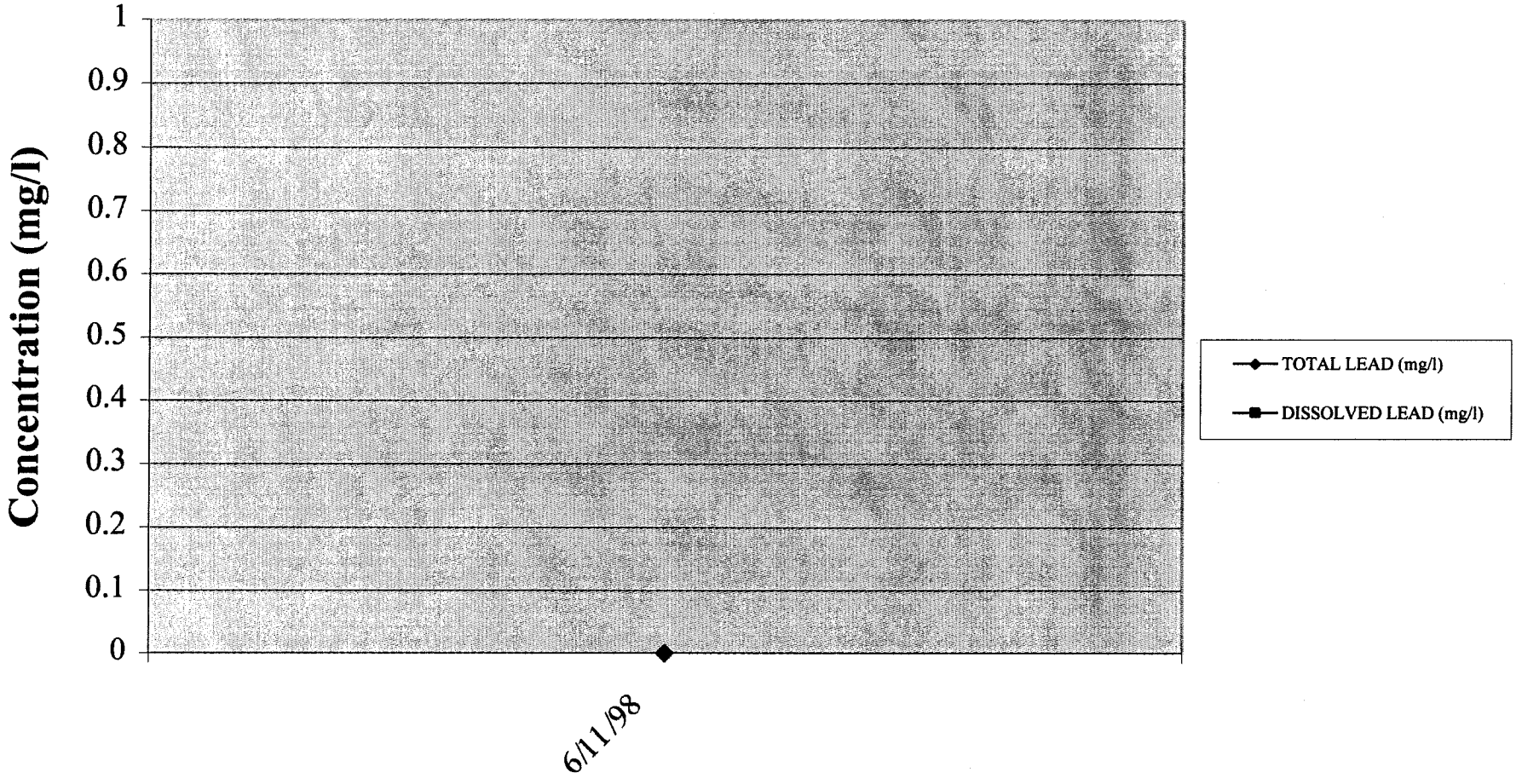
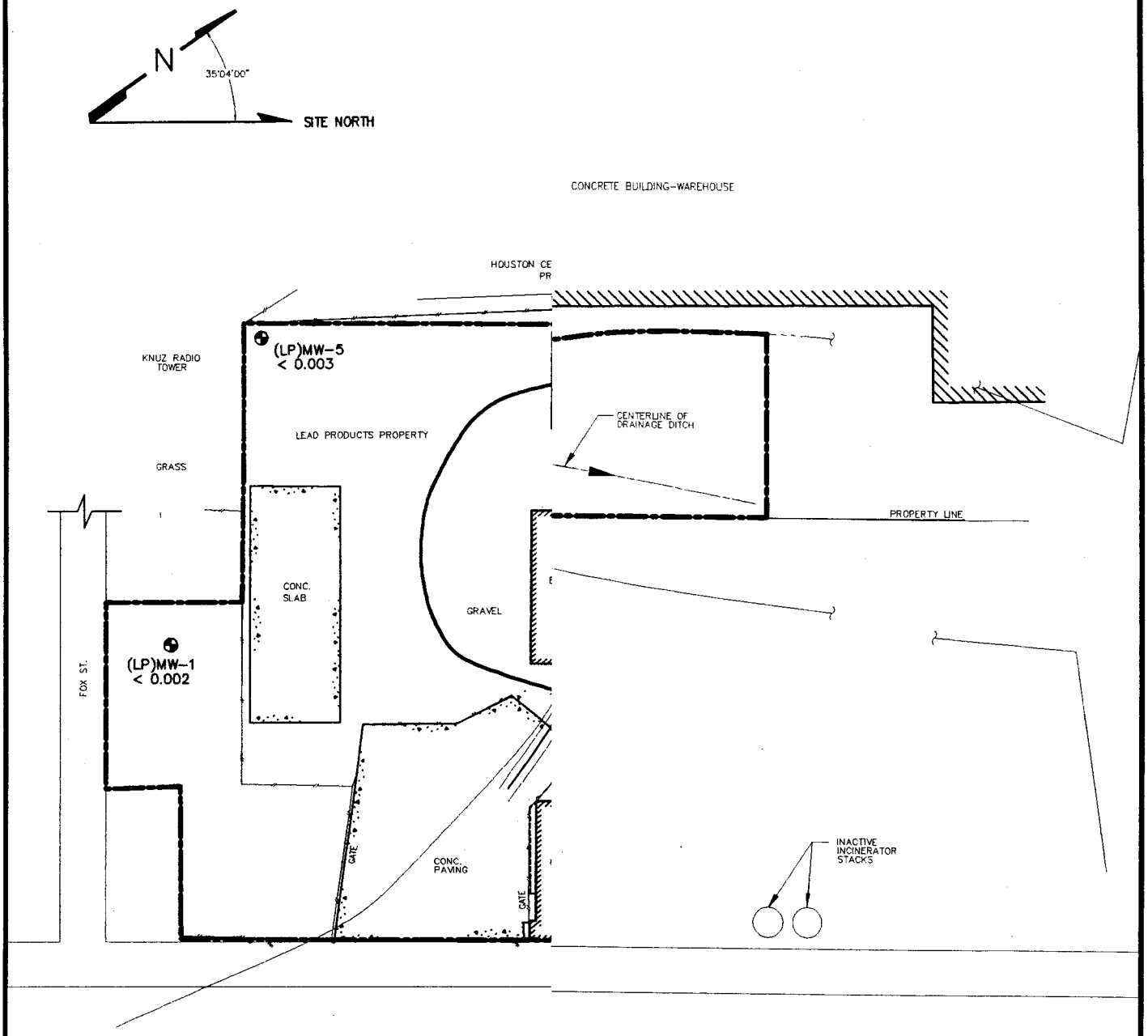


FIGURE 3-14
LEAD LEVELS IN (HCI)MW-1





0 50 100

SCALE IN FEET

LEGEND:

- ABANDONED RR SPUR
- SITE BOUNDARY
- DITCH CENTERLINE
- LEAD CONCENTRATION CONTOUR APPEARS TO EXCEED THE RRS# LEVEL OF 0.015 MG/L, BASED O MONITORING.
- (LP)MW-2 0.933 — MONITOR WELL WITH REPORTED L

NOTE: ALL LEAD CONCENTRATIOI SAMPLING EVENT, WITH THE EXC THESE RESULTS WERE OBTAINED ACTIVITIES.

WESTON MANAGERS DESIGNERS/CONSULTANTS

FIGURE 3-15

LEAD PRODUCTS CO., INC. NORTH VELASCO RD FACILITY

DELINEATION OF LEAD-AFFECTED GROUNDWATER

HOUSTON, TEXAS

DATE	PROJECT NO.	SCALE
MAY 99	105130010020070	1"=120'

H:\DWG\LEADPROD\FIGS\FIG3-15.CPB 05-25-99 (NEWWEST.PCP)

SECTION 4
CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

A number investigations have been completed at the LPCO site by ENSR and WESTON to delineate the vertical and horizontal extent of lead-affected soils and fill material comprised of battery casings. In addition, groundwater has been sampled to evaluate the hydrologic properties of the subsurface below the site and monitor lead concentrations over an extended period. Other investigations and/or assessments have been completed for the City of Houston as part of street and infrastructure improvements in the area of the LPCO site. Work has also been completed at the adjacent KQUE/KNUZ transmitter property. Based on these investigations, the following conclusions can be made:

- The stratigraphy at the LPCO site consists of a layer of fill material underlain by a clay layer (upper clay), a silty sand zone (shallow water-bearing zone), and a lower confining clay layer. The shallow water-bearing zone is approximately 12 to 18 feet deep and groundwater is typically encountered at a depth of 10 to 15 below ground surface.
- The groundwater at the site flows to the north at a gradient of approximately 0.008. The hydraulic conductivity at the site ranges from 9.87×10^{-4} to 9.49×10^{-3} cm/sec. The seepage velocity at the site has been calculated to range from 0.11 to 1.08 feet per day.
- Fill materials, typically comprised of crushed battery casings co-mingled with miscellaneous rubble, debris, and soils, are present throughout the site. Thickness of the fill varies from 1 to 10 feet and generally begins at the surface. It should be noted that the fill material does not appear to be in direct contact with the shallow groundwater.
- Fill materials containing battery casings are present on the KQUE/KNUZ property situated south of the LPCO property. This property is being addressed by a separate party and is not included in this report.
- Incinerator operations occurred for numerous years on the City of Houston property located north of the LPCO property. In addition to ACM being confirmed on-site, paint, debris piles, ash piles, and soils containing elevated levels of lead have been reported on this property.
- Numerous background surface soil samples have been collected to evaluate lead levels in areas that have been unaffected by LPCO activities. Reported concentrations in these samples have ranged from 5.49 to 2,230 mg/kg. In addition, subsurface soil samples have been collected in areas unaffected by lead from LPCO. Statistical

analysis of these subsurface soil samples indicates that the 95% UTL of the natural background lead concentrations in the soil is 15.5 mg/kg.

- Lead concentrations exceeding the RRS#2 SAI-Ind level of 1,000 mg/kg have been documented in surface soils covering the entire LPCO site and portions of the former Childs property. As depth below the ground surface increases, the level and extent of elevated lead concentrations decreases. Lead concentrations exceeding 1,000 mg/kg in subsurface soils (depths between 2 and 10 feet bgs) appear to be limited to two general areas on the LPCO property and one general area on the northwest portion of the former Childs property. There are no on-site areas where lead concentrations above 15.5 mg/kg were detected below a depth of 19 feet. Lead concentrations in the soils located in the lower confining layer appear to be representative of background conditions.
- Lead concentrations exceeding 1,000 mg/kg have been documented on the City of Houston property. Lead was reported in paint, debris, soil and ash pile samples. Based on historical operations at this property, lead in these samples does not appear to be associated with LPCO. The City of Houston Velasco Incinerator facility formerly operated on this property for numerous years. This facility formerly consisted of two buildings, each housing an incinerator and associated with two smokestacks. Fill material, consistent with the fill documented at the LPCO site, was observed in shallow soils (depths less than 2 feet bgs) located in the southwest corner of this property.
- Based on the analytical results, lead appears to be the only constituent that has been consistently documented at concentrations exceeding industrial risk levels.
- Lead concentrations exceeding the RRS#2 GW level of 0.015 mg/L have been consistently documented in Monitor Well (LP)MW-2 located on the LPCO property. Elevated lead concentrations have also been documented occasionally in two other wells located on-site. However, these lead concentrations have remained relatively unchanged throughout the years. Consequently, it can be concluded groundwater concentrations of lead in this limited area are stable and lead does not appear to be migrating from the areas of battery casing fill material.
- The extent of impact relating to historical LPCO operations has been defined sufficiently to allow the evaluation of remedial alternatives.
- The drainage ditch consists of non-hydric (non-wetland) soils and contains no jurisdictional wetlands

4.2 RECOMMENDATIONS

Based on the above conclusions, WESTON recommends that the following goals be established for the remediation of the LPCO site:

- Isolate the impacted surface soils from stormwater runoff;
- Isolate the impacted soil in the ditch from surface water flow;

- Minimize infiltration of rainfall through impacted soil into the groundwater; and
- Isolate the impacted surface soils to prevent exposure to human and ecological receptors.

To achieve these goals, WESTON recommends the installation of a clay cap over the undeveloped portions of the LPCO site. This is consistent with the approach presented in the design package submitted in January 1999. A similar remedy would be suitable for addressing the former Childs property. It is anticipated that a plan will be developed and submitted to the City of Houston and the TNRCC to propose the removal and/or consolidation of the battery casings located on the Ball Street right-of-way and the southwest corner of the incinerator site.

It is also recommended that a new storm sewer line be installed to connect the storm sewer at the south end of the ditch with the storm sewer at the north end of the ditch and that the ditch be backfilled and covered with a clay cap. This would prevent surface water from contacting the impacted soil and fill material currently present in the ditch.

The extent of the groundwater impacted by historical LPCO operations appears to be very limited and does not appear to have migrated off-site. Based on this, it appears that the groundwater is being controlled naturally and that active groundwater remediation will not be required. It is proposed that groundwater monitoring be continued for three years following the installation of the site cap and storm sewer line. If, at that time there has been no indication of plume expansion or migration, the groundwater monitoring would be discontinued.

SECTION 5
REFERENCES

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APPENDIX A

ENSR
ANALYTICAL SUMMARY TABLES
AND SAMPLING LOCATION MAPS

Lead Products Company, Inc.

Houston, Texas
2010

ENSR

Remediation Plan for the North Velasco Road Property

ENSR Consulting and Engineering

December 1990

Document Number 4200-003-600

EXHIBIT

TABLE 3-1

Analytical Summary of Soil Samples
Obtained During Previous Investigations (1985-1989)
Analytical Method: SW-846:3050, 6010, ICP

Lead Products Company, Inc. - Houston, Texas

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
02/28/85	1-1	0	13.9%
03/01/85	1-2 (pit)	2	290 mg/kg
	1-3 (pit)	4	374 mg/kg
02/28/85	2-1	0-.5	11.1%
03/01/85	2-2 (pit)	2	167 mg/kg
	2-3 (pit)	4	342 mg/kg
02/28/85	3-1	0-.5	11.7%
03/01/85	3-2 (pit)	2	871 mg/kg
	3-3 (pit)	4	1142 mg/kg
02/28/85	4-1	0-.5	9.64%
03/01/85	4-2 (pit)	2	2790 mg/kg
	4-3 (pit)	4	2180 mg/kg
02/28/85	5-1	0-.5	5.94%
03/01/85	5-2 (pit)	2	4.55%
	5-3 (pit)	4	4.35%
02/28/85	6-1	0-.5	3.88%
03/01/85	6-2 (pit)	2	3160 mg/kg
	6-3 (pit)	4	1012 mg/kg
02/28/85	7-1	0-.5	1.12%
03/01/85	7-2 (pit)	2	54 mg/kg
	7-3 (pit)	4	48 mg/kg
02/28/85	8-1	0-.5	8.10%
03/01/85	8-2 (pit)	2	610 mg/kg

TABLE 3-1 (Cont'd)

Analytical Summary of Soils Samples obtained during Previous Investigations (1985 to 1989)

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
03/01/85	8-3 (pit)	4	1164 mg/kg
02/28/85	9-1	0-.5	7.32%
03/01/85	9-2 (pit)	2	24 mg/kg
	9-3 (pit)	4	101 mg/kg
02/28/85	10-1	0-.5	10.9%
03/01/85	10-2 (pit)	2	114 mg/kg
	10-3 (pit)	4	101 mg/kg
02/28/85	11-1	0-.5	5.1%
03/01/85	11-2 (pit)	2	800 mg/kg
	11-3 (pit)	4	45 mg/kg
02/28/85	12-1	0-.5	4.64%
03/01/85	12-2 (pit)	2	4.68%
	12-3 (pit)	4	722 mg/kg
03/25/85	LPD-1	0-.5	1.59%
	LPD-2	0-.5	9.02%
	LPD-3	0-.5	4.37%
	LPD-4	0-.5	3.90%
	LPD-5	0-.5	2.30%
	LPD-6	0-.5	3.36%
	LPD-7	0-.5	4.40%
03/25/85	LPD-8	0-.5	2.06%
	LPD-9	0-.5	1.43%
03/25/85	LPTP-1-1	0-.5	2.60%
	LPTP-1-3	≈1.5	0.97%

TABLE 3-1 (Cont'd)

Analytical Summary of Soils Samples obtained during Previous Investigations (1985 to 1989)

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
03/25/85	LPTP-1-2	3	81 mg/kg
	LPTP-2-1	0-.5	5.86%
	LPTP-2-3	≈2	693 mg/kg
	LPTP-2-2	3.5	200 mg/kg
	LPTP-3-1	0-.5	2.88%
	LPTP-3-3	≈2	2230 mg/kg
	LPTP-3-2	4.5	77 mg/kg
	LPTP-4-1	0-.5	8.79%
	LPTP-4-3	≈3.5	5.69%
	LPTP-4-2	7	2050 mg/kg
	LPTP-5-1	0-.5	6.72%
	LPTP-5-3	≈2	768 mg/kg
	LPTP-5-2	4	85 mg/kg
03/26/85	LPTP-6-1	0-.5	6.72%
	LPTP-6-3	≈1.5	4.44%
	LPTP-6-2	3	53 mg/kg
	LPTP-7-1	0-.5	1.22%
03/26/85	LPTP-7-3	≈ 1	449 mg/kg
	LPTP-7-2	2	26 mg/kg
	LPTP-8-1	0-.5	4301 mg/kg
	LPTP-8-3	≈2	47 mg/kg
	LPTP-8-2	4	39 mg/kg
	LPTP-9-1	0-.5	2570 mg/kg
	LPTP-9-3	≈2	363 mg/kg
	LPTP-9-2	4	12 mg/kg
	LPTP-10-1	0-.5	1.24%

TABLE 3-1 (Cont'd)

Analytical Summary of Soils Samples obtained during Previous Investigations (1985 to 1989)

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
03/26/85	LPTP-10-3	≈1	294 mg/kg
	LPTP-10-2	2.5	57 mg/kg
	LPTP-11-1	0-.5	15.76%
	LPTP-11-2	8	0.93%
	LPTP-12-1	0-.5	7.80%
	LPTP-12-2	9	6650 mg/kg
	LPTP-13-1	0-.5	6.50%
	LPTP-13-3	≈3.5	565 mg/kg
	LPTP-13-2	7	4870 mg/kg
	LPTP-14-1	0-.5	6.89%
	LPTP-14-2	9.5	8960 mg/kg
	LPTP-15-1	0-.5	2.00%
	LPTP-15-2	6	6920 mg/kg
	LPTP-16-1	0-.5	11.36%
	LPTP-16-3	≈3	2.33%
	LPTP-16-2	6	281 mg/kg
04/18/85	D-1-1	0-.5	6.70%
	D-1-2	1.5	8.25%
	D-2-1	0-.5	2.70%
	D-2-2	1.5	1.53%
	D-3-1	0-.5	1900 mg/kg
	D-3-2	1.5	560 mg/kg
	D-4-1	0-.5	1.81%
	D-4-2	1.5	1.52%
	D-5-1	0-.5	4710 mg/kg

TABLE 3-1 (Cont'd)

Analytical Summary of Soils Samples obtained during Previous Investigations (1985 to 1989)

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
04/18/85	D-5-2	1.5	1510 mg/kg
	D-6-1	0-.5	2.43%
	D-6-2	1.5	387 mg/kg
	D-7-1	0-.5	2380 mg/kg
	D-7-2	1.5	1330 mg/kg
	D-8-1	0-.5	3160 mg/kg
	D-8-2	1.5	90 mg/kg
12/21/88	00A	≈8	9.4 mg/kg
	00B	≈9	16 mg/kg
	01A	≈7	12 mg/kg
	01B	≈8	13 mg/kg
	02A	≈8	22 mg/kg
	02B	≈9	22 mg/kg
	03A	≈7	43 mg/kg
	03B	≈8	11 mg/kg
	04A	≈10	13 mg/kg
	04B	≈11	12 mg/kg
	05A	≈4	13 mg/kg
	05B	≈5	11 mg/kg
	06A	≈8	16 mg/kg
	06B	≈9	16 mg/kg
	07A	≈3	180 mg/kg
	07B	≈4	170 mg/kg
	08A	≈6	250 mg/kg
	08B	≈7	270 mg/kg

TABLE 3-1 (Cont'd)

Analytical Summary of Soils Samples obtained during Previous Investigations (1985 to 1989)

Date Taken	Soil Sample #	Depth of Sample (ft)	Total Lead (mg/kg or %)
12/22/88	10A	=1	700 mg/kg
	10B	=2	320 mg/kg
01/06/89	NSD-1	0-.5	9650 mg/kg
	NSD-2	0-.5	8150 mg/kg
	NSD-3	0-.5	167 mg/kg
	NSD-4	0-.5	45.2 mg/kg

TABLE 3-2

Analytical Summary of Ditch Water Samples
Obtained During the Previous Site Investigations (1985-1989)
EPA Method: SW-846: 6010, ICP
Lead Products Company, Inc. - Houston, TX

Date Taken	Sample Number	pH	Total Lead (mg/kg)
04/18/85	D5-WS-1	6.9 (standing)	<0.01
	D8-WS-1	11.0 (running)	<0.01
01/06/89	DW-1	(standing)	<0.02

11.0 pH

TABLE 3-3

Analytical Summary of Background and Surface Soil Samples Obtained During the Recent Site Investigation (October - December 1990) Analytical Method: EPA:SW-846 3050, 6010, ICP

Lead Products Company, Inc. - Houston, TX

Date Taken	Sample Number	Depth of Sample (ft)	Total Lead (mg/kg or %)	TCLP Lead (mg/l)
10/08/90	10/08/90 B1 Surface	0-.5	2000	4.6
	10/08/90 B2 Surface	0-.5	2900	3.9
	10/08/90 B3 Surface	0-.5	2400	2.3
11/14/90	11/14/90 B4 Surface	0-.5	6.3%	NA
	11/14/90 B5 Surface	0-.5	9%	NA
	11/14/90 B6 Surface	0-.5	12%	NA
	11/14/90 B7 Surface	0-.5	1100	NA
11/16/90	COH-1-BKG	0-.5	160	NA
	COH-2-BKG	0-.5	18	NA
	Park-BKG	0-.5	230	NA
	Childs 1-BKG	0-.5	190	NA
	Childs 2-BKG	0-.5	520	NA
	Childs 3-BKG	0-.5	560	NA
	Childs 4-BKG	0-.5	610	NA

NA - Not Analyzed

Pb conc 7 than these

TABLE 3-4

Analytical Summary of Soil Boring Samples
Obtained During the Recent Site Investigation (October - December 1990)
Analytical Method: EPA SW-846 3050, 6010, ICP

Lead Products Company, Inc. - Houston, TX

Date Taken	Sample Number	Depth of Sample (ft)	Total Lead (mg/kg)	TCLP Lead (mg/l)
10/08/90	(LP)B-1B	18 - 20	<5	.07
	(LP)B-1C	20 - 21	5.1	.09
	(LP)B-1D	21.5 - 22	10	.03
	(LP)B-1E	22 - 22.5	8.8	<.025
	(LP)B-2A	10 - 10.5	25	.4
	(LP)B-2B	10.5 - 11	8.4	<.025
	(LP)B-2C	11 - 12	<5	<.025
	(LP)B-2D	12 - 12.5	<5	.07
	(LP)B-2E	15 - 16	<5	<.025
	(LP)B-2F	18 - 19	5.6	<.025
	(LP)B-3A	10 - 10.5	23	.1
	(LP)B-3B	10.5 - 11	9.1	.03
	(LP)B-3C	11 - 12	<5	.04
	(LP)B-3D	12 - 12.5	21	4.5
	(LP)B-3E	12.5 - 13	8	.04
	(LP)B-3F	13 - 13.5	<5	.04
10/10/90	(LP)MW-2A	9.5 - 10	210,000	.1
	(LP)MW-3A	7.9 - 8.4	33	.5
	(LP)MW-4A	15 - 15.5	10	.06
	(LP)MW-4A	16 - 16.5	11	.07
	(LP)MW-4C	18.5 - 19	<5	.04
	(LP)MW-4D	19.5 - 20	8.6	<.025

TABLE 3-4 (Cont'd)

Analytical Summary of Soil Boring Samples
Obtained During the Recent Site Investigation (October - December 1990)
Analytical Method: EPA SW-846 3050, 6010, ICP

Date Taken	Sample Number	Depth of Sample (ft)	Total Lead (mg/kg)	TCLP Lead (mg/l)
10/12/90	(LP)MW-1A	.5 - 1	11	.04
	(LP)MW-1B	8 - 8.5	<5	<.025
	(LP)MW-1C	10.5 -11	<5	<.025
	(LP)MW-1D	19.5 - 20	<5	<.025
	(LP)MW-1E	20.5 - 21.4	7.9	.04
	(LP)MW-3B	10 - 11	<5	<.025
	(LP)MW-3C	14 - 14.7	<5	.04
	(LP)MW-3D	15 - 15.7	<5	.03
	(LP)MW-3E	17 - 17.5	<5	.04
	(LP)MW-2B	12 - 13	30	1.5
	(LP)MW-2C	16 - 16.5	29	.7
	(LP)MW-2D	16.5 - 17.5	34	.3
	(LP)MW-2E	19 - 19.5	8.4	<.025
12/06/90	Childs B-4-A	6 - 7	18	<.025
	Childs B-4-B	9.5 - 10.5	18	<.025
	Childs B-4-C	18 - 19	<5	<.025
	Childs B-4-D	19.8 - 21	7.8	<.025
	Childs B-5-A	5 - 6	5600	4.8
	Childs B-5-B	9 - 10	16	0.025
	Childs B-5-C	13.7 - 14	<5	.2

TABLE 3-4 (Cont'd)

Analytical Summary of Soil Boring Samples
Obtained During the Recent Site Investigation (October - December 1990)
Analytical Method: EPA SW-846 3050, 6010, ICP

Date Taken	Sample Number	Depth of Sample (ft)	Total Lead (mg/kg)	TCLP Lead (mg/l)
12/06/90	Childs B-5-D	15 - 16	<5	<.025
	Childs B-5-E	16.9 - 17.9	<5	<.025
	COH B-6-A	2.5 - 3.5	61	.2
	COH B-6-B	5.7 - 6	<5	<.025
	COH B-6-C	7 - 8	<5	<.025
	COH B-6-D	16 - 16.3	<5	<.025
	COH B-6-E	16.5 - 17	6.2	1.0
12/07/90	COH B-7-A	0 - 2	11,000	25
	COH B-7-B	5.5 - 6	31	.07
	COH B-7-C	11 - 12	<5	.04
	COH B-7-D	16 - 16.8	<5	<.025
	COH B-7-E	17 - 17.5	11	<.025
	LPB B-8-A	7.5 - 8	<5	<.025
	LPB B-8-B	9.5 - 10	<5	<.025
	LPB B-8-C	19.7 - 20.3	15	<.025

TABLE 3-4 (Cont'd)

Analytical Summary of Soil Boring Samples
Obtained During the Recent Site Investigation (October - December 1990)
Analytical Method: EPA SW-846 3050, 6010, ICP

Date Taken	Sample Number	Depth of Sample (ft)	Total Lead (mg/kg)	TCLP Lead (mg/l)
12/07/90	LPB B-8-D	17.5 - 18.5	<5	<.025
	LPB B-8-H	19.7 - 20.3	9.8	<.025

TABLE 3-4A

Summary of Geotechnical Results
Lead Products Company, Inc. - Houston, TX

Sample I.D.#	Sample Interval (ft)	Date Obtained	Moisture* Content (%)	Dry* Density (pcf)	Atterberg* Limits			Permeability* (cm/sec)
					LL	PL	PI	
(LP)MW-2	16 - 18	10/12/90	17	117	43	16	27	8.39×10^{-9}

* Test Method for Soil Moisture was ASTM, D2216-80
* Test Method for Dry Density was Man. of Soil Lab Volume 1, 3, 5.2
* Test Method for Atterberg Limits was ASTM D422-63
* Test Method for Permeability was Army Corp. of Engineers: EM-1110-2-1906.

TABLE 3-5

Analytical Results from Groundwater Sampling Conducted on November 5, 1990

Lead Products Company, Inc. - Houston, TX

Date Obtained	Well Number	Total Lead (mg/l)	Dissolved Lead (mg/l)	Chlorides (mg/l)	Sulfate (mg/l)	pH (units)	Specific Conductivity (μmhos)
11-05-90	(LP)MW-1	<0.025	<0.025	14	560	6.46	316
	(LP)MW-2*	2.8	1.0	66	760	5.15	242
	(LP)MW-3	0.04	<0.025	66	1000	5.72	346
	(LP)MW-4	<0.025	<0.025	17	220	6.49	178
	(LP)OW-10**	3.2	2.1	53	680	–	—

*(LP)MW-2 groundwater sample contained floating white globules.
** (LP)OW-10 does not exist. It is a duplicate sample of (LP)MW-2.

TABLE 3-6

Water Level Elevations
Obtained November 5, 1990
Lead Products Company, Inc. - Houston, TX

Monitor Well	Ground Surface Elevation (ft/msl)	Top of Casing Elevation (ft/msl)	Depth to Water (ft)	Water Elevation ft (msl)
(LP)MW-1	35.5	37.95	13.13	24.82
(LP)MW-2	33.3	36.22	13.56	22.66
(LP)MW-3	32.1	35.02	14.68	20.34
(LP)MW-4	35.2	35.04	15.09	19.95

TABLE 4-1

Soil Treatability Study
TCLP and Total Lead
Analytical Method: SW-846 3050, 6010, ICP

Lead Products Company, Inc. - Houston, TX

Hazardous!

Date Taken	Soil Sample Number	Depth of Sample	Total Lead	*Test Amount of Cement per sq. yard	Resultant TCLP Lead
11/14/90	1-89-1	Surface	9.9%	4%	350
	1-89-2	Surface	8.6%	8%	170
	1-89-3	Surface	14%	12%	10

*Design at 53 lbs cement per square yard to 8-inch depth (0.22 cu. yd.) or 8% cement by volume. Test run at 4%, 8%, and 12%.

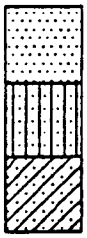
APPENDIX B

ENSR SOIL BORING LOGS

GRAPHIC SYMBOLS FOR BORING LOGS AND WELL COMPLETIONS

LOGS AND CROSS SECTIONS

FILL



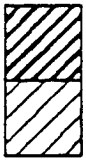
SAND

SILTY SAND

CLAYEY SAND

SILT OR CLAYEY SILT

SANDY SILT



CLAY

SANDY CLAY OR SILTY CLAY

SHALE

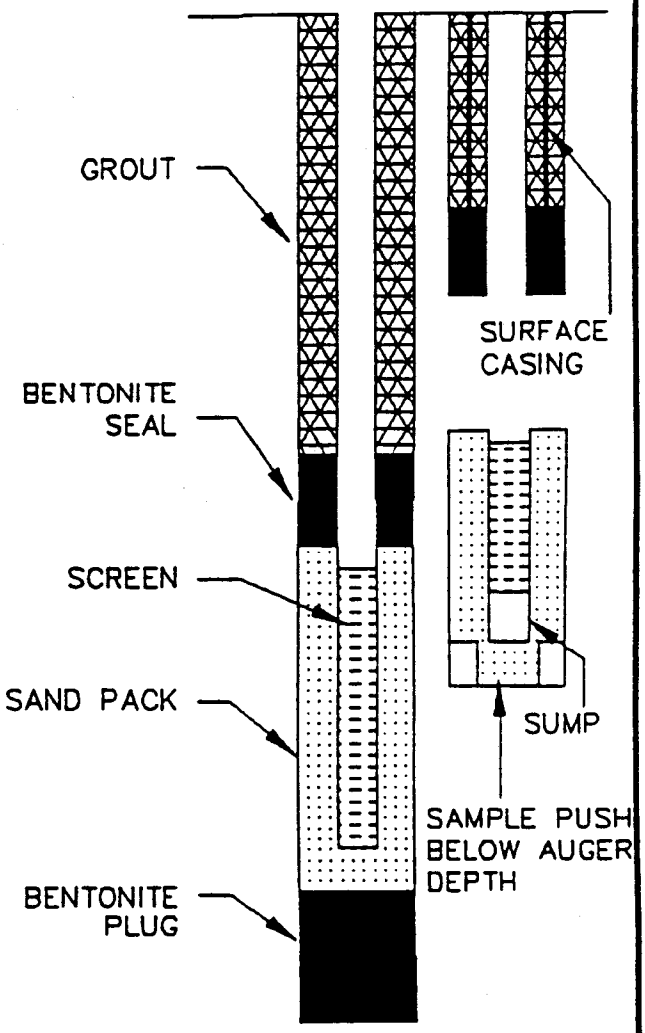
PEAT

LIMESTONE

GRAVEL

SAND & GRAVEL

WELL COMPLETIONS



NOTE:
1) SPLIT SPOON SAMPLER WAS HYDRAULICALLY PRESSED WHEN NO BLOW COUNTS ARE INDICATED.
2) NW – DENOTES HNu AND/OR OVA INSTRUMENTS NOT WORKING.
3) CS – DENOTES CHEMICAL SAMPLE INTERVAL.
4) GS – DENOTES GEOTECHNICAL SAMPLE INTERVAL.

ENSR

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-B-1

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-B-1
Logged By : H.D. VENABLE
Approved By : BRUCE DANIEL
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TEXAS

DRILLING AND SAMPLING INFORMATION
Date Started : 10/12/90 Date Completed : 10/12/90
Method : HSA Total Depth : 24.0 FT
WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

SURFACE ELEVATION : 36.1 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/kg)	GRAPHIC LOG
2	FILL, medium dense, black to dark gray, coarse sandy road base with gravels to one inch, slightly moist.							
	SAND (SW), loose, lt brown, fine to med grained, slightly moist.							
4	SILTY CLAY (CL), soft, dark brown mottled with orange and black, some fine to medium grained sand partings, highly plastic, moderately moist.							
6								
8	SILTY SAND (SM), medium dense, light brown, fine grained, moderately moist.							
10	10'-14' - Color changes to gray.							
12								
14	14'-16.5' - Color changes to gray with black mottling.							
16	16.5'-21.5' - Moisture change to saturated, consistency change to loose.							
18		1	SS	1.5		CS	<5	
20		2	SS	2.0		CS	5.1	
22	CHAY (CH), stiff, gray mottled with orange, moist to slightly moist.					CS	10.0	
						CS	8.8	
		3	ST	2.0				
	SAND (SW), loose, gray, fine grained, wet to saturated.							

SAMPLER TYPE
SS - DRIVEN SPLIT SPOON RC - ROCK CORE
ST - PRESSED SHELBY TUBE CT - CONTINUOUS TUBE

BORING METHOD
HSA - HOLLOW STEM AUGER DC - DRIVING CASING
CFA - CONTINUOUS FLIGHT AUGERS MD - MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-B-2

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-B-2
Logged By : H.D. VENABLE
Approved By : BRUCE DANIEL
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TEXAS

Date Started : 10/12/90 Date Completed : 10/12/90
Method : HSA Total Depth : 20.0 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

DEPTH IN FEET	DESCRIPTION SURFACE ELEVATION : 34.4 FT. MSL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/Kg)	GRAPHIC LOG
2	FILL, soft, dark brown, moderately plastic clay with gravels to 1/4 inch, red clay fragments, slightly moist.							
4	SILTY CLAY (CL), moderately stiff, gray with yellow mottling, moderately moist to dry.							
6								
8	7'-10' - Color change to light brown.							
10	SILTY CLAY (ML), stiff, gray, mottled orange and black, fine grained sandy clay, moderately moist to dry	1	ST	1.5		CS	25.0	
						CS	8.4	
						CS	<5	
12						CS	<5	
	SILTY SAND (SM), loose-medium dense, light brown to gray with orange mottling, silty, fine to medium sand, moist.	2	ST	1.5				
14	SAND (SW), loose, light brown with orange mottling, fine grained, saturated.	3	ST	1.5				
16						CS	<5	
		4	ST	1.0				
18	CLAY (CL), stiff, gray, moderately moist	5	ST	1.5		CS	5.6	
20								
22								

SAMPLER TYPE
SS - DRIVEN SPLIT SPOON RC - ROCK CORE
ST - PRESSED SHELBY TUBE CT - CONTINUOUS TUBE

BORING METHOD
HSA - HOLLOW STEM AUGER DC - DRIVING CASING
CFA - CONTINUOUS FLIGHT AUGERS MD - MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-B-3

Client : HOUSTON LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-B-3
Logged By : H.D. VENABLE
Approved By : BRUCE DANIEL
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TEXAS

DRILLING AND SAMPLING INFORMATION
Date Started : 10/13/90 Date Completed : 10/13/90
Method : HSA Total Depth : 18 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

SURFACE ELEVATION : 32.5 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/Kg)	GRAPHIC LOG
0	FILL, soft, grayish brown, moderately plastic clayey silt with gravels to 1/8 inch diameter and battery casing fragments, very moist							
10	CLAY (CL), moderately stiff–stiff,brown with gray mottling, moist to dry. 10'–12.5' – Color change to gray with orange mottling.	1	ST	1.5		CS	23	
						CS	9.1	
						CS	<5	
12	SILTY SAND (SM), loose, gray mottled with orange and black, fine grained, moist.	2	ST	2.0		CS	21	
						CS	8.0	
						CS	<5	
14	15'–17' – Moisture change to very wet.	3	SS	2.0				
16		4	SS	2.0				
18	CLAY (CL), stiff, gray, moist–dry.							
20								
22								

SAMPLER TYPE
SS – DRIVEN SPLIT SPOON
ST – PRESSED SHELBY TUBE
RC – ROCK CORE
CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGERS
DC – DRIVING CASING
MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF CHILDS–B–4

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200–003 Boring No : CHILDS–B–4
Logged By : J. BARRINGER
Approved By : B. DANIEL
Drilled By : LAYNE ENVIRONMENTAL DRILLING, HOUSTON, TX.

DRILLING AND SAMPLING INFORMATION
Date Started : 12/6/90 Date Completed : 12/6/90
Method : HSA Total Depth : 22.0 FT.

WELL COMPLETION INFORMATION
Screen Dia : N\A Length : N\A
Slot Size : N\A Type : N\A
Casing Dia : N\A Length : N\A

SURFACE ELEVATION : 34.1 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (PPM)	GRAPHIC LOG
0–2	FILL, clayey sand mixed with concrete fragments, chert and quartz gravel, loose, white and orange, non–plastic, dry, no odor.	1	SS	.7				
2–4	SILTY SANDY CLAY (CL), firm, dark tan and light gray with ferrous mottling and occ. black natural mottling, medium plastic, abundant v.f.g. sandy partings, slt. moist, no odor.	2	SS	1.7				
4–6		3	SS	1.9				
6–8		4	SS	2		CS	18	
8	---From 8.4'–8.8'–layer of clayey sand, soft moist							
8–10	SANDY CLAY (CL), stiff, light tan with ferrous mottling, medium plastic, v.f.g. sand, slt. moist, no odor.	5	SS	1.7				
10						CS	18	
10–12	SILTY SAND (SM), loose, homogeneously buff and cream with very occ. ferrous mottles, non–plastic, abundant micaceous mineral fragments, approx. 40% silt, 40% v.f.g. sand, 10% f.g. sand, and 10% clay, well sorted, very moist to wet, no odor.	6	SS	2				
12–14		7	SS	2				
14	---From 14 to 18 ft., becomes wet to saturated, more f.g. sand, trace med. g. sand.							
14–16		8	SS	2				
16–18		9	SS	1.6				
18	---Saturated from 18'–19.5' ---							
18–20		10	SS	2		CS	< 5	
20	CLAY/SILTY CLAY (CH/CL), very stiff, light gray with light ferrous mottling, med. to highly plastic, slt. moist, no odor.							
20–22		11	SS	2		CS	7.8	

SAMPLER TYPE
SS – DRIVEN SPLIT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF CHILDS B-5

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TX
Job Number : 4200-003-200 CHILDS B-5
Logged By : J. BARRINGER
Approved By : B. DANIELS
Drilled By : LAYNE ENVIRONMENTAL DRILLING, HOUSTON, TX.

DRILLING AND SAMPLING INFORMATION
Date Started : 12/6/90 Date Completed : 12/6/90
Method : HSA Total Depth : 20.0 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

SURFACE ELEVATION : 33.0 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/Kg)
0	FILL, 0-1" grass and roots						
	1"-2.0' quartz gravel, shell fragments, and clay mixed with silty tan and dark brown sand, moist, non-plastic, no odor	1	SS	1.6			
2	2.0-8.4' clayey silt mixed with pockets of clay and shell fragments, soft, dark brown, very occasional battery casing chip, very moist, slight plasticity, no odor	2	SS	0.0			
4							
	5.5-6.0' black ash-like carbanaceous material, no odor, roots very light	3	SS	1.0		CS	5600
6	--- 6.0' hit slag mixed with concrete, wire, and nails	4	SS	0.5			
8	SANDY CLAY (CL), soft, heavily mottled orange and tan, slight plasticity, very moist, fine sand, some silt, no odor, no staining	5	SS	2.0		CS	16
10	CLAYEY SAND (SC), soft, heavily mottled orange and tan, slight plasticity, very moist, fine sand, some silt, no odor, no staining	6	SS	1.3			
12		7	SS	2.0			
14	SILTY SAND (SM), loose, buff and cream with very occ. orange mottling, non-plas., slt. moist, approx. 40% silt, 40% sand, trace clay, no staining, no odor					CS	< 5
	SANDY CLAY (CL), stiff, homogeneous, tan and buff, slight plasticity, very fine sand, very moist, no odor, no staining	8	SS	2.0			
16							
	CLAY/SILTY CLAY (CH), very stiff, gray and tan with light orange mottling, medium to high plasticity, sandy pockets, slightly moist, no odor, no staining, pp at 17' = 3.2, pp at 19' = 3.2	9	SS	1.6		CS	< 5
18	19.7-20.0' calcareous nodules	10	SS	1.7			
20							
22							

SAMPLER TYPE
SS - DRIVEN SPLIT SPOON RC - ROCK CORE
ST - PRESSED SHELBY TUBE CT - CONTINUOUS TUBE

BORING METHOD
HSA - HOLLOW STEM AUGER DC - DRIVING CASING
CFA - CONTINUOUS FLIGHT AUGERS MD - MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF C.O.H. B-6

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TX
Job Number : 4200-003-200 Boring No : CITY OF HOUSTON B-6
Logged By : J. BARRINGER
Approved By : B. DANIELS
Drilled By : LAYNE ENVIRONMENTAL DRILLING, HOUSTON, TX.

DRILLING AND SAMPLING INFORMATION
Date Started : 12/6/90 Date Completed : 12/6/90
Method : HSA Total Depth : 18.0 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

SURFACE ELEVATION : 33.8 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (PPM)	GRAPHIC LOG
2	FILL, concrete chips, brick fragments, no sample obtained for 0–2' interval.							
		1	ST	1.0		CS	61	
4	SILTY SANDY CLAY (CL), firm to stiff, tan, light brown, and gray with speckled orange mottling, slight to medium plasticity, slightly moist, no odor, no staining.	2	ST	1.0				
6	SANDY CLAY (CL), firm to stiff, light gray with orange mottling, slight plasticity, slightly moist.					CS	< 5	
		3	ST	1.3		CS	< 5	
8	SANDY SILT/SILTY SAND (SM), dense to compact, homogeneous buff and cream, non-plastic, approximately 50% silt, 50% very fine sand, occasional rootlet, very moist, no odor, no staining.	4	ST	1.4				
10								
	11.5–16.3' becoming more fine grained, approximately 10% clay, very dense sand.	5	ST	1.6				
12								
		6	ST	1.5				
14								
		7	ST	0.0				
16								
	CLAY (CH) with little silt, stiff to very stiff, homogeneous light gray, medium to high plasticity, slightly moist, no odors, no staining.	8	ST	1.9		CS	6.2	
18								
20								
22								

SAMPLER TYPE
SS – DRIVEN SPUT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF C.O.H. B-7

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TX
Job Number : 4200-003-200 Boring No : CITY OF HOUSTON B-7
Logged By : J. BARRINGER
Approved By : B. DANIELS
Drilled By : LAYNE ENVIRONMENTAL DRILLING, HOUSTON, TX.

DRILLING AND SAMPLING INFORMATION
Date Started : 12/7/90 Date Completed : 12/7/90
Method : HSA Total Depth : 18.0 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

SURFACE ELEVATION : 32.7 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (PPM)	GRAPHIC LOG
2	FILL, sandy clay, loose, dark brown and black, mixed with wood, battery fragments, glass, and brick, wet, no odor, no staining	1	SS	1.6		CS	1.1	
		2	SS	1.5				
4	SILTY SANDY CLAY (CL), soft to firm, dark tan and light gray with speckled orange mottling, medium plasticity, flocculated appearance, no battery casings, moist, no odor, no staining sandy pockets, pp at 5' = 2.2	3	ST	1.0		CS	31	
6	– 6.0', becomes firm to stiff silty clay, pp at 7.5' = 2.0	4	ST	1.4				
8	SANDY CLAY(CL), firm, light gray and buff with orange mottling, slight to medium plasticity, slightly moist, approximately 40% very fine sand, no battery casings, no odor, no staining	5	ST	1.6				
10	CLAYEY SILTY SAND (SC), soft, homogeneous, buff and cream, slight to non-plastic, very moist, very fine sand, mica fragments, grades to silty sand at 12.0', no odor, no staining	6	ST	1.0		CS	< 5	
12	SILTY SAND(SM), loose, homogeneous, cream and buff, non-plastic, approximately 10% clay, fine to very fine sand, very moist, no odor, no staining, abundant mica fragments,	7	ST	1.4				
14	14–16.8', wet, clay lense from 14.5–14.6'	8	ST	1.3				
16						CS	< 5	
	CLAY (CH), with little silt, very stiff to hard, light gray to buff with orange mottling, medium to high plasticity, slightly moist, no odor, no staining, pp at 16.8' = 3.5, pp at 17.8' = 4.5	9	ST	2.0		CS	11	
18								
20								
22								

SAMPLER TYPE
SS – DRIVEN SPLIT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-B-8

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TX
Job Number : 4200-003-200 Boring No : LP-B-8
Logged By : J. BARRINGER
Approved By : B. DANIELS
Drilled By : LAYNE ENVIRONMENTAL DRILLING, HOUSTON, TX.

DRILLING AND SAMPLING INFORMATION
Date Started : 12/7/90 Date Completed : 12/7/90
Method : HSA Total Depth : 22.0 FT

WELL COMPLETION INFORMATION
Screen Dia : N/A Length : N/A
Slot Size : N/A Type : N/A
Casing Dia : N/A Length : N/A

DEPTH IN FEET	DESCRIPTION SURFACE ELEVATION : 36.1 FT. MSL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/Kg)	GRAPHIC LOG
0	FILL, clayey silt, soft to loose, dark brown to black, mixed with wood chips and battery fragments, roots, non-plastic, very moist	1	SS	1.0				
2	SILTY CLAY (CL), soft, dark gray with speckled orange mottling, medium plasticity, very moist, occasional roots, no battery casings	2	SS	1.4				
4	– From 4' becomes firm to stiff silty clay with abundant black ferrous nodules and calcareous nodules, pp at 5.8' = 2.0	3	ST	1.6				
6		4	ST	1.9				
8	SANDY CLAY (CL), firm, dark gray with orange mottling, slight plasticity, very fine sand, very moist, occasional black ferrous nodule	5	ST	1.2		CS	< 5	
10	SILTY SAND (SM), with little clay, loose, homogeneous, cream and buff, non-plastic, abundant mica fragments, fine to very fine sand, wet, no odor, no staining – From 10-12' light gray with slight ferrous mottling	6	ST	1.0		CS	< 5	
12	– From 12 to 17.8' saturated, trace medium sand and clay	7	SS	1.4				
14		8	SS	0.9				
16		9	SS	1.6				
18	SANDY CLAY/CLAYEY SAND (CL/SC), soft, light gray and buff, red from 18-19.7', slight palsticity, wet	10	SS	1.8		CS	< 5	
20	CLAY (CH), with little silt, very stiff to hard, red with gray mottling from 19.7-20.2', 20.2-22' light gray with occasional ferrous mottling and abundant black speckled mottling, high plasticity, slightly moist to dry, pp at 20' = 3.5, pp at 21' = 3.5	11	ST	1.9		CS	15	
22								

SAMPLER TYPE
SS – DRIVEN SPLIT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-MW-1

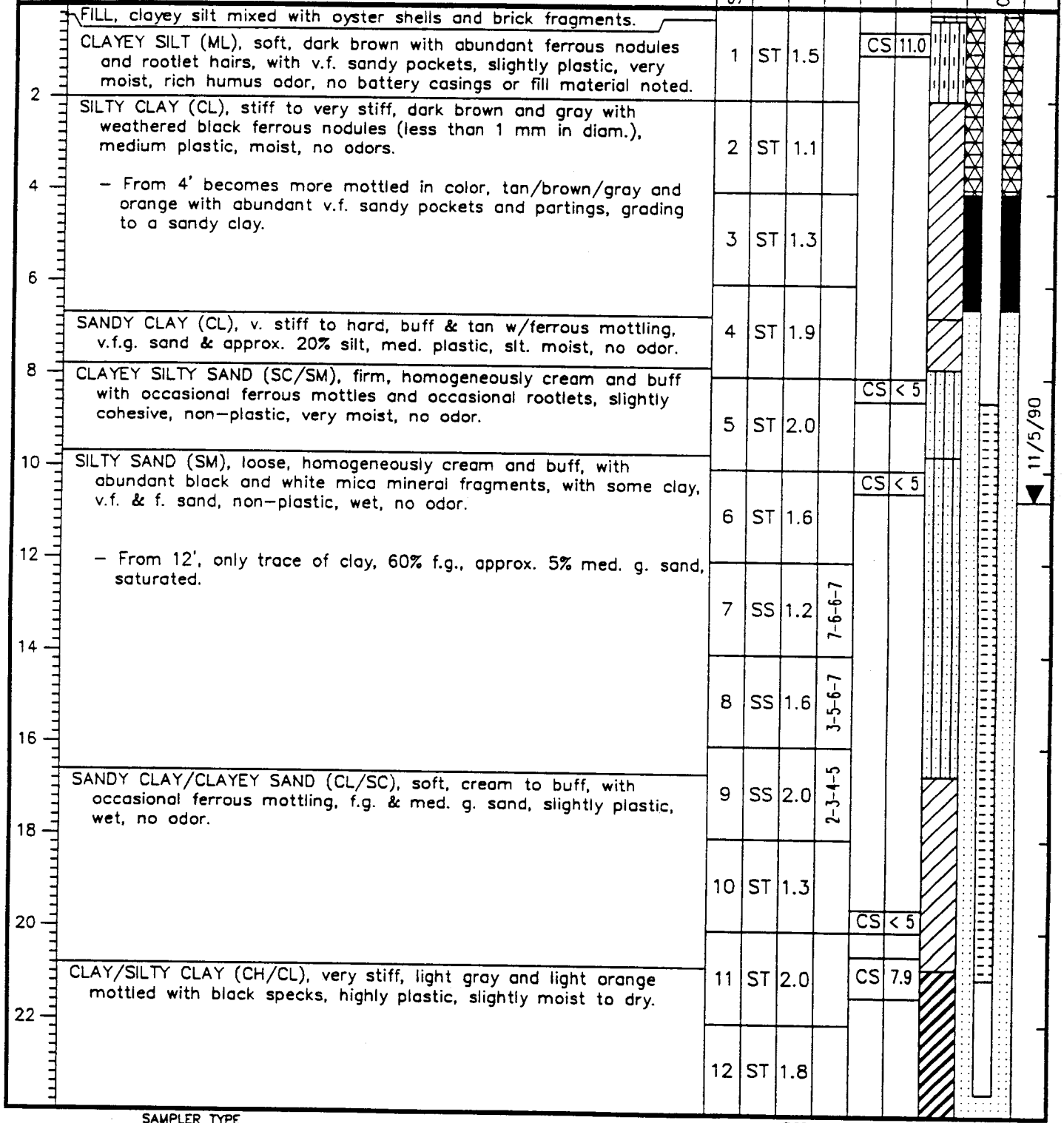
Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-MW-1
Logged By : J. BARRINGER
Approved By : B.DANIELS
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TX

DRILLING AND SAMPLING INFORMATION
Date Started : 10/12/90 Date Completed : 10/12/90
Method : HSA Total Depth : 24.0 FT
WELL COMPLETION INFORMATION
Screen Dia : 4 IN. I.D. Length : 12.5 FT
Slot Size : 0.010 IN Type : PVC SCH40
Casing Dia : 4 IN I.D. Length : 8.5 FT

TOP OF CASING ELEVATION : 37.95 FT. MSL
SURFACE ELEVATION : 35.5 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/kg)
0	FILL, clayey silt mixed with oyster shells and brick fragments.						
2	CLAYEY SILT (ML), soft, dark brown with abundant ferrous nodules and rootlet hairs, with v.f. sandy pockets, slightly plastic, very moist, rich humus odor, no battery casings or fill material noted.	1	ST	1.5		CS	11.0
4	SILTY CLAY (CL), stiff to very stiff, dark brown and gray with weathered black ferrous nodules (less than 1 mm in diam.), medium plastic, moist, no odors. – From 4' becomes more mottled in color, tan/brown/gray and orange with abundant v.f. sandy pockets and partings, grading to a sandy clay.	2	ST	1.1			
6		3	ST	1.3			
8	SANDY CLAY (CL), v. stiff to hard, buff & tan w/ferrous mottling, v.f.g. sand & approx. 20% silt, med. plastic, slt. moist, no odor.	4	ST	1.9			
10	CLAYEY SILTY SAND (SC/SM), firm, homogeneously cream and buff with occasional ferrous mottles and occasional rootlets, slightly cohesive, non-plastic, very moist, no odor.	5	ST	2.0		CS	< 5
12	SILTY SAND (SM), loose, homogeneously cream and buff, with abundant black and white mica mineral fragments, with some clay, v.f. & f. sand, non-plastic, wet, no odor. – From 12', only trace of clay, 60% f.g., approx. 5% med. g. sand, saturated.	6	ST	1.6		CS	< 5
14		7	SS	1.2	7-6-6-7		
16		8	SS	1.6	3-5-6-7		
18	SANDY CLAY/CLAYEY SAND (CL/SC), soft, cream to buff, with occasional ferrous mottling, f.g. & med. g. sand, slightly plastic, wet, no odor.	9	SS	2.0	2-3-4-5		
20		10	ST	1.3		CS	< 5
22	CLAY/SILTY CLAY (CH/CL), very stiff, light gray and light orange mottled with black specks, highly plastic, slightly moist to dry.	11	ST	2.0		CS	7.9
		12	ST	1.8			

GRAPHIC LOG / WELL COMPLETION / WATER LEVEL



SAMPLER TYPE
SS – DRIVEN SPLIT SPOON
ST – PRESSED SHELBY TUBE
RC – ROCK CORE
CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGERS
DC – DRIVING CASING
MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-MW-2

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-MW-2
Logged By : J. BARRINGER
Approved By : B.DANIELS
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TX

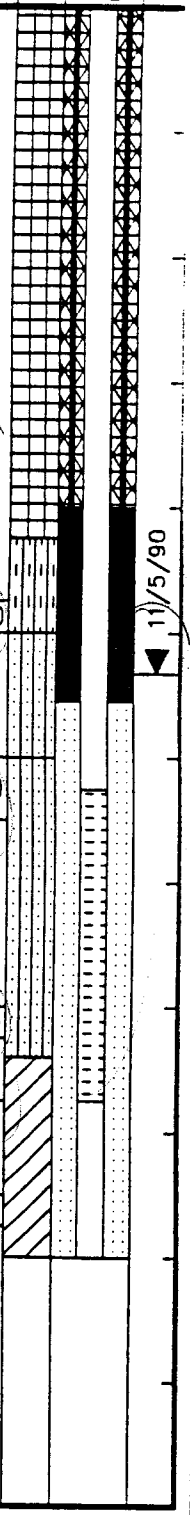
DRILLING AND SAMPLING INFORMATION
Date Started : 10/10/90 Date Completed : 10/12/90
Method : HSA Total Depth : 20.0 FT

WELL COMPLETION INFORMATION
Screen Dia : 4 IN I.D. Length : 5.0 FT
Slot Size : 0.010 IN Type : PVC SCH40
Casing Dia : 4 IN I.D. Length : 12.5 FT

TOP OF CASING ELEVATION : 36.22 FT. MSL
SURFACE ELEVATION : 33.3 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/kg)
2	FILL, crushed battery casings mixed with dark brown to black clayey silt and silty clay, firm, moist, possible acid odor, very occasional rootlets and ferrous nodules, non-plastic.	1	ST	1.0			
4	5.0' – Silty clay lense, dark gray, very soft, slightly plastic.	2	ST	0.9			
6	6.0'-7.0' – increase in battery pieces, comprise 75% of sample, up to 2"x1" in size, angular, non-plastic, very moist to slightly wet.	3	ST	1.5			
8	6.5'-7.0' – Hit water in the battery casing. 7.0'-8.0' – Battery casings are larger, approx. 6"-8", still wet. 8.0'-8.5' – Saturated with an acid odor. 8.5'-11.5' – Furnace slag rocks and possible lead slag mixed with sand.	4	ST	1.0			
		5	ST	1.0			
10		6	ST	1.0		CS	21000
		7	ST	1.8			
12	SILTY SAND (SM), loose, light gray, homogeneously cream and buff, with abundant mica mineral fragments, v.f.&f.g. sand, rounded, with some clay, non-plastic, wet, slight sour acid odor.	8	SS	0.9		CS	30.0
14	14.0'-16.8' – Silty v.f.g. sand, very dense and compacted, sligtly wet, no odor, almost consolidated.	9	SS	0.9			
16		10	SS	1.0			
		11	ST	1.3		CS	29.0
18	SILTY CLAY/CLAY (CL/CH), very stiff, homogeneously light gray, flocculated on fresh break, medium to high plasticity, slightly moist to dry, no odor.					CS	34.0
		12	ST	1.5		CS	8.4
20							
22							

GRAPHIC LOG / WELL COMPLETION / WATER LEVEL



SAMPLER TYPE
SS – DRIVEN SPLIT SPOON
ST – PRESSED SHELBY TUBE
RC – ROCK CORE
CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER
CFA – CONTINUOUS FLIGHT AUGERS
DC – DRIVING CASING
MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP-MW-3

Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200-003 Boring No : LP-MW-3
Logged By : J. BARRINGER
Approved By : B.DANIELS
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TX

DRILLING AND SAMPLING INFORMATION
Date Started : 10/10/90 Date Completed : 10/12/90
Method : HSA Total Depth : 17.5 FT

WELL COMPLETION INFORMATION
Screen Dia : 4 IN I.D. Length : 5.0 FT
Slot Size : 0.010 IN Type : PVC SCH40
Casing Dia : 4 IN I.D. Length : 10.0 FT

TOP OF CASING ELEVATION : 35.02 FT. MSL
SURFACE ELEVATION : 32.1 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/kg)
0	FILL, battery casings, parts mixed with silty clay and clayey silt, rubber battery casings comprise 90% of fill, soil only 10%.						
5.0'-7.0' – Non-plastic, dry, mixed with slag.		1	ST	1.6			
7.0'-7.9' – Less battery parts, more soil, clayey silt mixed with glass, rubber, slag, black, moist, non-plastic, no acid odors.		2	ST	1.9		CS	33
8	CLAYEY SAND (SC), firm, tan/lt.gry/buff/w/Fe mot.,sl plas, v.moist.						
SILTY SAND (SM), loose, homogeneously light gray, cream and buff, with occasional mica minteral fragments, trace of clay, v.f. & f.g. sand, rounded, non-plastic, slightly wet, no odor.		3	SS	1"			
		4	SS	1.7		CS	< 5
13.5' – Becomes wet to saturated.		5	SS	2.0			
						CS	< 5
14	CLAY/SILTY CLAY (CH/CL), very stiff, light gray and light orange mottled with black ferrous nodules, highly plastic, slightly moist to dry, no odors.	6	SS	2.0		CS	< 5
		7	ST	1.6			
18						CS	< 5
20							
22							

GRAPHIC LOG / WELL COMPLETION / WATER LEVEL: ▼ 11/5/90

SAMPLER TYPE
SS – DRIVEN SPLIT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

ENSR CONSULTING & ENGINEERING

SUBSURFACE EXPLORATION — LITHOLOGIC LOG OF LP–MW–4

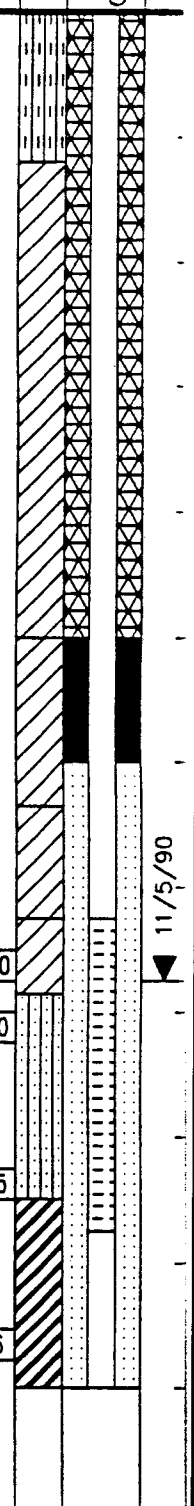
Client : LEAD PRODUCTS
Project Name : SUBSURFACE INVESTIGATION
Project Location : HOUSTON, TEXAS
Job Number : 4200–003 Boring No : LP–MW–4
Logged By : J. BARRINGER
Approved By : B.DANIELS
Drilled By : FUGRO GEOSCIENCES, HOUSTON, TX

DRILLING AND SAMPLING INFORMATION
Date Started : 10/11/90 Date Completed : 10/11/90
Method : HSA Total Depth : 22.0 FT

WELL COMPLETION INFORMATION
Screen Dia : 4 IN I.D. Length : 5.0 FT
Slot Size : 0.010 IN Type : PVC SCH40
Casing Dia : 4 IN I.D. Length : 14.5 FT

TOP OF CASING ELEVATION : 35.04 FT. MSL
SURFACE ELEVATION : 35.2 FT. MSL

DEPTH IN FEET	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (FEET)	BLOW COUNT	CHEMICAL SAMPLE INT	TOTAL LEAD (mg/kg)
0–2	CLAYEY SILT (ML), dark brown to black mixed with caliche and gravel, with little v.f.g. sand, many rootlets, slightly plastic, very moist, no odors or staining, dark humus soil, no battery casings.	1	ST	0.9			
2–4	SILTY CLAY (CL), firm, tan, light gray, with ferrous mottling, abundant v.f.g. sandy partings (white), with occasional ferrous mottles, medium plastic, no staining, moist, no odor.	2	ST	1.7			
4–6		3	ST	1.2			
6–8	5.5'–10.0' – Becomes light gray silty clay, stiff, with abundant ferrous mottles 1–2 mm in diameter.	4	ST	1.8			
8–10	8.0'–8.5' – Layer of sandy clay, very lt. gray, with ferrous mottling, f.g. sand, slightly plastic.	5	ST	1.9			
10–12	SANDY CLAY (CL), stiff, medium gray with clusters of dark green mottles (could be weathered glauconite), threadlike ferrous mottles, v.f.g. sand with 15% silt, slightly plastic, moist, no staining or odor.	6	ST	2.0			
12–14	SILTY CLAY (CL), very stiff, medium gray and dark green, with abundant dark green and ferrous mottles, medium to highly plastic, moist.	7	ST	2.0			
14–16	SANDY CLAY (CL), stiff, medium gray with clusters of dark green mottles, threaklike ferrous mottles, v.f.g. sand with 15% filt, slightly plastic, no staining or odor.	8	ST	1.9		CS	10.0
16–18	SILTY SAND (SM), loose, light tan, buff and light gray, abundant black mica mineral fragments, approximately 45%–50% f.g. sand, 15%–20% v.f.g. sand, 5%–10% med. g. sand, rounded, trace clay, non–plastic, slightly saturated, no staining.	9	SS	0.9		CS	11.0
18–20	CLAY/SILTY CLAY (CH/CL), very stiff to hard, homogeneously medium to light gray, wit occasional ferrous mottles, abundant weathered calcareous nodules (angular, 2mm–6mm in diameter), highly plastic, slightly moist, no odor or staining.	10	SS	1.9		CS	< 5
20–22		11	ST	1.8		CS	8.6



SAMPLER TYPE
SS – DRIVEN SPLIT SPOON RC – ROCK CORE
ST – PRESSED SHELBY TUBE CT – CONTINUOUS TUBE

BORING METHOD
HSA – HOLLOW STEM AUGER DC – DRIVING CASING
CFA – CONTINUOUS FLIGHT AUGERS MD – MUD DRILLING

WELL NUMBER: (LP) MW-1

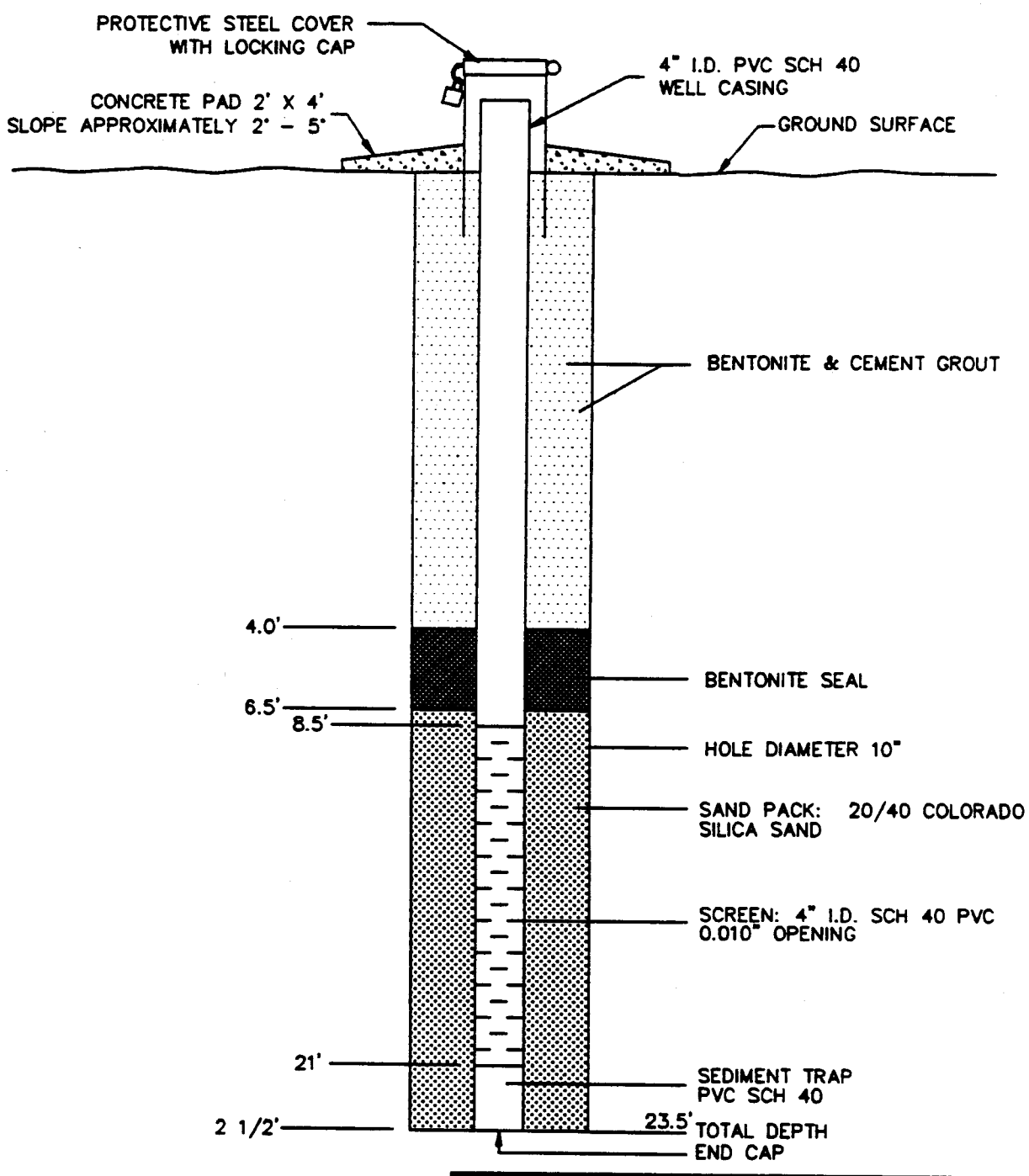
DATE INSTALLED: 10-12-90

TYPE COMPLETION: ABOVE GRADE

GROUND SURFACE ELEVATION: 35.5 FT.

TOP WELL CASING ELEVATION: 37.95 FT.
(MEASUREMENT POINT)

LOCATION: N 1875.04 E 7712.25



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SITE CHARACTERIZATION INV.
MONITOR WELL COMPLETION DETAIL

LEAD PRODUCTS COMPANY, INC.
HOUSTON, TEXAS

DRAWN BY: S.JACKSON	DATE: 12/13/90	PROJECT NUMBER:
CHK'D.BY:	REVISED:	4200-003

CE420011

WELL NUMBER: (LP) MW-2

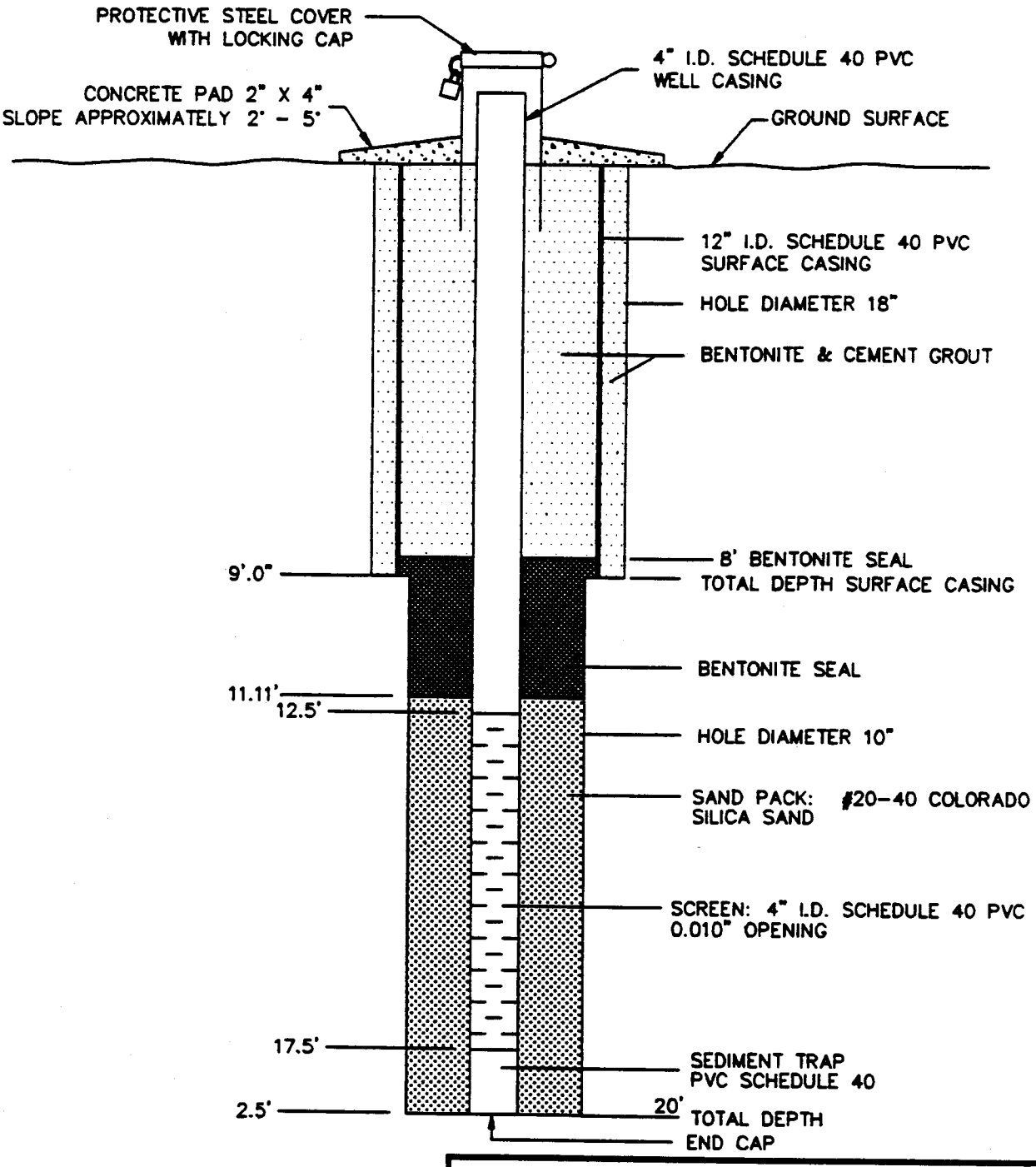
DATE INSTALLED: 10-10-90

TYPE COMPLETION: ABOVE GROUND

GROUND SURFACE ELEVATION: 33.3 FT.

TOP WELL CASING ELEVATION: 36.22 FT.
(MEASUREMENT POINT)

LOCATION: N 1969.73 E 8117.11



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ENSR CONSULTING AND ENGINEERING

SITE CHARACTERIZATION INV.
MONITOR WELL COMPLETION DETAIL

LEAD PRODUCTS COMPANY, INC.
HOUSTON, TEXAS

DRAWN BY: S.JACKSON	DATE: 12/13/90	PROJECT NUMBER: 4200-003
CHK'D.BY:	REVISED:	

CE420010

WELL NUMBER: (LP) MW-3

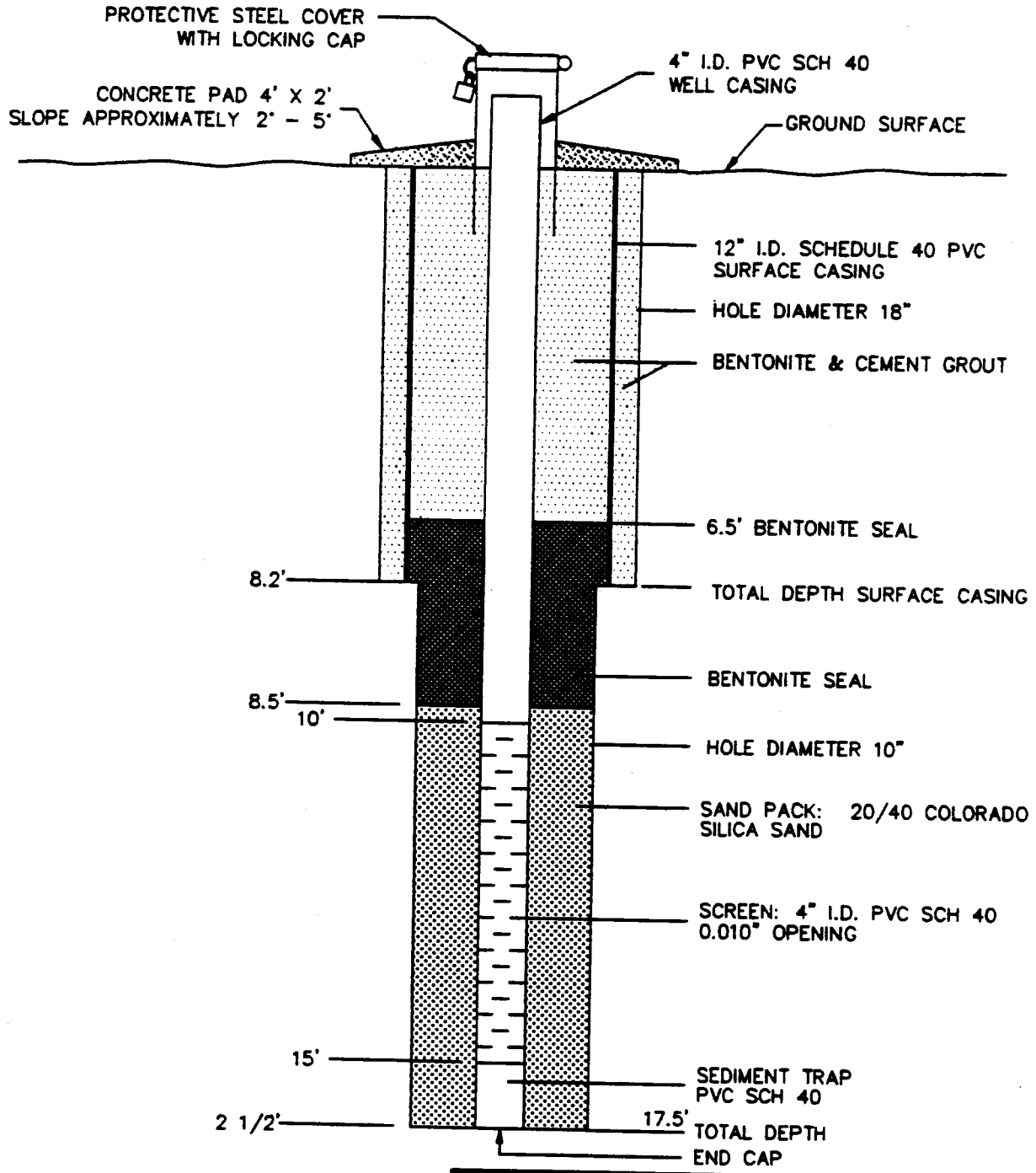
DATE INSTALLED: 10-10-90

TYPE COMPLETION: ABOVE GROUND

GROUND SURFACE ELEVATION: 32.1 FT.

TOP WELL CASING ELEVATION: (MEASUREMENT POINT) 35.02 FT.

LOCATION: N 2089.98 E 8227.31



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SITE CHARACTERIZATION INV.
MONITOR WELL COMPLETION DETAIL

LEAD PRODUCTS COMPANY, INC.
HOUSTON, TEXAS

DRAWN BY: S.JACKSON	DATE: 12/13/90	PROJECT NUMBER: 4200-003
CHK'D.BY:	REVISED:	

CE420012

WELL NUMBER: (LP) MW-4

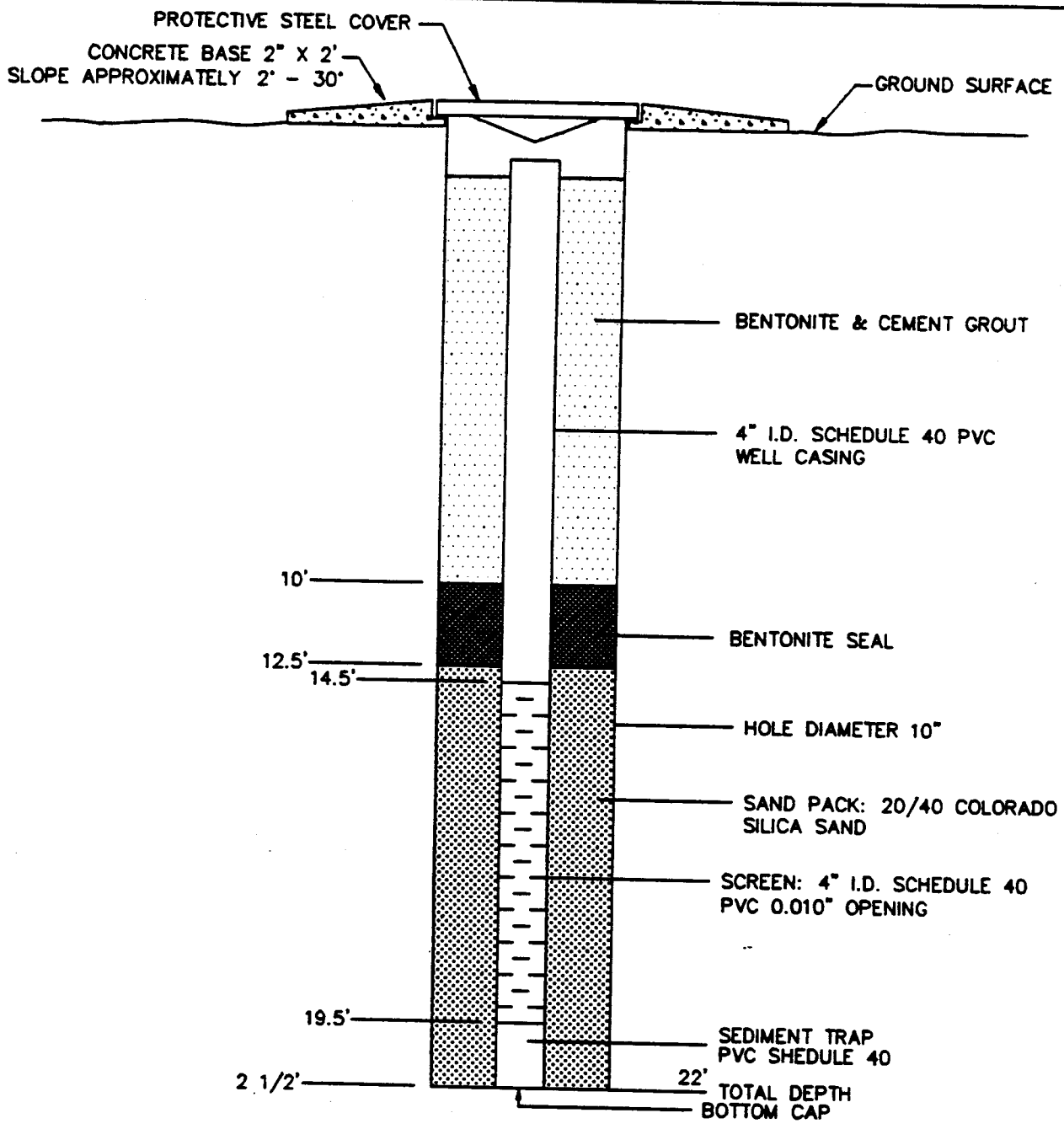
DATE INSTALLED: 10-11-90

TYPE COMPLETION: BELOW GROUND

GROUND SURFACE ELEVATION: 35.2

TOP WELL CASING ELEVATION: (MEASUREMENT POINT) 35.04

LOCATION: N 2230.21 E 8039.39



ENSR CONSULTING AND ENGINEERING

SITE CHARACTERIZATION INV.
MONITOR WELL COMPLETION DETAIL

LEAD PRODUCTS COMPANY INC.
HOUSTON, TEXAS

DRAWN BY: S.JACKSON	DATE: 12/13/90	PROJECT NUMBER: 4200-003
CHK'D.BY:	REVISED:	

CE420009

APPENDIX C

SWL SOIL BORING LOGS, ANALYTICAL SUMMARY TABLES AND SAMPLE LOCATION MAP

SUBSURFACE INVESTIGATION REPORT
Ball Street Extension
Houston, Texas

Prepared for:

CITY OF HOUSTON
Capital Projects
Houston, Texas
GFS No. N-0446-12-5
Contract No. 31480

Lee Garrett
Project Manager

Mark Hemingway
Program Manager

Prepared by:

SWL ENVIRONMENTAL SERVICES
4150-B Freidrich Lane
Austin, Texas 78744
(512) 447-9081 692 9151

April 1993

TABLE 1
ANALYTICAL SUMMARY OF SOIL SAMPLES
City of Houston
Bell Street Extension
Houston, Texas

SAMPLE No./ DEPTH	LEAD (mg/kg)	TCLP LEAD (mg/l)
SB1-1/2'	446	5.47
SB1-2/4'	703	164
SB1-3/6'	789	65.7
SB1-4/8'	1,770	5.04
SB1-5/10'	3,660	48
SB2-1/2'	626	35.3
SB2-2/4'	3,520	2.51
SB2-3/6'	4,510	123
SB2-4/8'	433	1.35
SB2-5/10'	23.5	0.93
SB3-1/2'	11,400	105
SB3-2/4'	1,420	74.6
SB3-3/6'	15.7	0.77
SB3-4/8'	18.1	BDL
SB3-5/10'	329	23.1
SB4-1/2'	7,940	9.38
SB4-2/4'	17.8	0.77
SB4-3/6'	17	BDL
SB4-4'8'	12	BDL
SB4-5/10'	BDL	BDL
SB5-1/2'	13,700	12.3

TABLE 1, Continued
ANALYTICAL SUMMARY OF SOIL SAMPLES
City of Houston
Bell Street Extension
Houston, Texas

SAMPLE No./ DEPTH	LEAD (mg/kg)	TCLP LEAD (mg/l)
SB5-2/4'	14.7	BDL
SB5-3/6'	12.2	BDL
SB5-4/8'	40.1	BDL
SB5-5/10'	12.2	BDL
SB6-1/2'	15.9	BDL
SB6-2/4'	32.6	BDL
SB6-3/6'	12.6	BDL
SB6-4/8'	24.7	BDL
SB6-5/10'	10.7	BDL
SB7-1/2'	11.1	BDL
SB7-2/4'	BDL	BDL
SB7-3/6'	10.5	.64
SB7-4/8'	BDL	BDL
SB7-5/10'	283	BDL
SB8-1/2'	11.4	BDL
SB8-2/4'	12.7	BDL
SB8-3/6'	10.9	BDL
SB8-4/8'	BDL	BDL
SB8-5/10'	15.5	BDL
SB9-1/2'	BDL	BDL
SB9-2/4'	11.8	BDL
SB9-3/6'	12.8	BDL

TABLE 1, Continued
ANALYTICAL SUMMARY OF SOIL SAMPLES
City of Houston
Bell Street Extension
Houston, Texas

SAMPLE No./ DEPTH	LEAD (mg/kg)	TCLP LEAD (mg/l)
SB9-4/8'	15.2	BDL
SB9-5/10'	17.8	BDL
SB10-1/2'	14.4	BDL
SB10-2/4'	13	BDL
SB10-3/6'	BDL	BDL
SB10-4/8'	BDL	BDL
SB10-5/10'	BDL	BDL
SB11-1/2'	BDL	BDL
SB11-2/4'	BDL	BDL
SB11-3/6'	12	BDL
SB11-4/8'	10.7	BDL
SB11-5/10'	10.8	BDL
SB12-1/2'	10.8	BDL
SB12-2/4'	10.3	BDL
SB12-3/6'	BDL	BDL
SB12-4/8'	10.1	BDL
SB12-5/10'	BDL	BDL
HAB1-1/2'	42	BDL
HAB1-2/4'	60.9	BDL
HAB2-1/2'	15.6	BDL
HAB2-2/4'	14.3	BDL
HAB3-1/2'	137	BDL

TABLE 1, Continued
ANALYTICAL SUMMARY OF SOIL SAMPLES
City of Houston
Bell Street Extension
Houston, Texas

SAMPLE No./ DEPTH	LEAD (mg/kg)	TCLP LEAD (mg/l)
HAB3-2/4'	205	BDL
HAB4-1/2'	43.2	BDL
HAB4-2/4'	73	BDL
HAB5-1/2'	5,140	5.84
HAB5-2/4'	6,610	7.13
HAB6-1/2'	3,430	5.02
HAB7-1/2'	8,900	8.62
HAB8-1/2'	4,270	11.9

BDL - Below Detection Limit
mg/kg - milligrams per kilograms
mg/l - milligrams per liter
Depth - in feet below ground level
TCLP - Toxicity Characteristic Leaching Procedure
Note - All samples collected on 3/9/1993 or 3/19/1993

LOG OF BORING NO. SB-1

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist					
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
5						
						LEAD, TCLP LEAD
	Silty SAND, uniform, medium dense, fine grained, tan, moist					LEAD, TCLP LEAD
10						LEAD, TCLP LEAD
15						
20						
25						

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

9257980 4-15-93

LOG OF BORING NO. SB-2

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist					
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
5						
						LEAD, TCLP LEAD
	Silty SAND, uniform, medium dense, fine grained, tan, moist					LEAD, TCLP LEAD
						LEAD, TCLP LEAD
10						
15						
20						
25						

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

9287990 --5-93

LOG OF BORING NO. SB-3

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (+)	SCREENING DATA: VISIBLE (+)	SCREENING DATA: DIRECT READING INSTRUMENT	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist					
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
5						
						LEAD, TCLP LEAD
	Silty SAND, uniform, medium dense, fine grained, tan, moist					LEAD, TCLP LEAD
10						LEAD, TCLP LEAD
15						
20						
25						

Client: City of Houston Project No.: 505892-679 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

LOG OF BORING NO. SB-4

DEPTH, (FT)	SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (+)	SCREENING DATA: VISIBLE (+)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
		Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist						
								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
5								LEAD, TCLP LEAD
		Silty SAND, uniform, medium dense, fine grained, tan, moist						LEAD, TCLP LEAD
								LEAD, TCLP LEAD
10								
15								
20								
25								

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

9287930: 4-15-93

LOG OF BORING NO. SB–5

DEPTH, (FT)	SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY		SCREENING DATA: ODOR (+)	SCREENING DATA: VISIBLE (+)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
		Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist							
									LEAD, TCLP LEAD
									LEAD, TCLP LEAD
5									LEAD, TCLP LEAD
		Silty SAND, uniform, medium dense, fine grained, tan, moist							LEAD, TCLP LEAD
10									LEAD, TCLP LEAD
15									
20									
25									

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method – Hammered Split Spoon

SOUTHWESTERN LABORATORIES

LOG OF BORING NO. SB-6

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist						
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
5							
							LEAD, TCLP LEAD
	Silty SAND, uniform, medium dense, fine grained, tan, moist						LEAD, TCLP LEAD
10							LEAD, TCLP LEAD
15							
20							
25							

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/9/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

LOG OF BORING NO. SB-7

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (+)	SCREENING DATA: VISIBLE (+)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist						
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
5							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
10							
15							
20							
25							

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

LOG OF BORING NO. SB-8

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist					
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
5						
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
10						LEAD, TCLP LEAD
15						
20						
25						

Client: City of Houston Project No.: 505892-679 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

92879828 --/5-93

LOG OF BORING NO. SB-9

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY		SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist							
								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
5								
								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
10								LEAD, TCLP LEAD
15								
20								
25								

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

92579309 4-15-93

LOG OF BORING NO. SB-10

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist					
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
5						
						LEAD, TCLP LEAD
						LEAD, TCLP LEAD
10						LEAD, TCLP LEAD
15						
20						
25						

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

LOG OF BORING NO. SB-11

DEPTH, (FT)	SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (•)	SCREENING DATA: VISIBLE (•)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
		Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist						
								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
5								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
								LEAD, TCLP LEAD
10								
15								
20								
25								

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

928793 4-15-93

LOG OF BORING NO. SB-12

DEPTH, (FT) / SAMPLES	DESCRIPTION OF STRATUM	% RECOVERY	SCREENING DATA: ODOR (+)	SCREENING DATA: VISIBLE (+)	SCREENING DATA: DIRECT READING INSTRUMENT	SCREENING DATA	SUBMITTED FOR ANALYSIS
	Silty CLAY, plastic, stiff, clay with 25% silt, gray, moist						
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
5							
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
							LEAD, TCLP LEAD
10							
15							
20							
25							

Client: City of Houston Project No.: 505892-879 Date Drilled: 3/10/93 Driller: GPI

Groundwater Elevation: Date: ____ Time: ____ Elevation: ____ Date: ____ Time: ____ Elevation: ____

Ground Elevation: ____ Ground Elevation: ____ Ground Elevation: ____

Comments: Drilling Method - Hammered Split Spoon

SOUTHWESTERN LABORATORIES

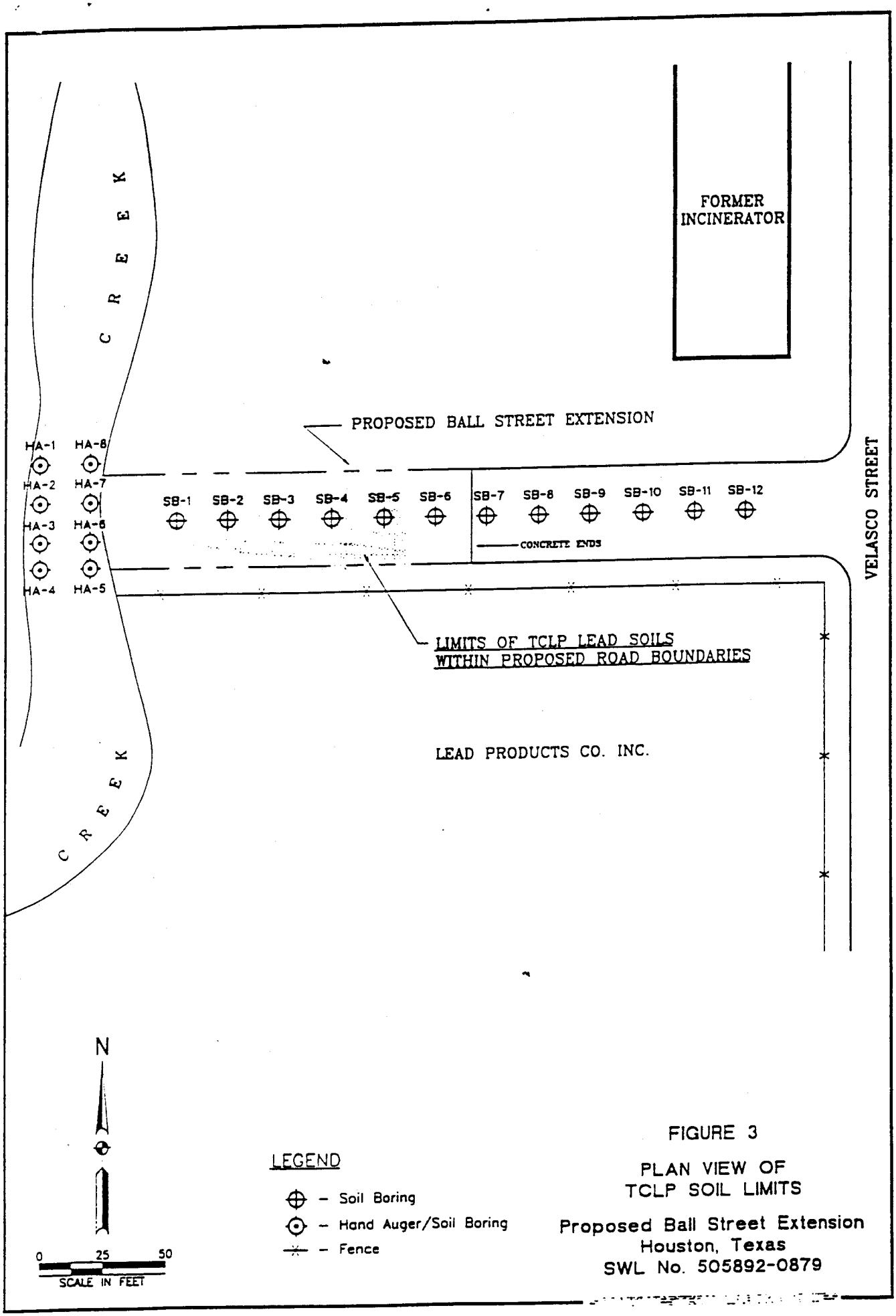


FIGURE 3

PLAN VIEW OF
TCLP SOIL LIMITS

Proposed Ball Street Extension
Houston, Texas
SWL No. 505892-0879

APPENDIX D

CDM
ANALYTICAL SUMMARY TABLE
AND SAMPLE LOCATION MAP

CDM Camp Dresser & McKee

Report

Table 1
City of Houston
Greater Houston Wastewater Program
North Velasco Street Lift Station

Parameter	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Detection Limit (mg/kg)	0.06	0.11	0.06	0.06	0.06	0.025	0.07	0.06
Results								
EB-1 (0-0.5)	12.45	536.96	<0.06	43.58	2949.42	0.151	<0.07	<0.06
EB-1 (2-2.5)	1.92	176.92	<0.06	11.54	661.54	0.074	<0.07	<0.06
EB-1 (4-4.5)	<0.06	92.64	<0.06	34.88	71.32	<0.025	<0.07	<0.06
EB-1 (6-6.5)	10.47	724.81	<0.06	68.99	1972.87	0.361	<0.07	<0.06
EB-1 (15-15.5)	<0.06	83.08	<0.06	15.04	736.84	0.073	<0.07	<0.06
EB-1 (24.5-25)	<0.06	43.18	<0.06	3.03	9.47	<0.025	<0.07	<0.06
EB-2 (2-2.5)	<0.06	76.25	<0.06	8.33	37.08	<0.025	<0.07	<0.06
EB-2 (4-4.5)	<0.06	132.09	<0.06	3.36	4.10	<0.025	<0.07	<0.06
EB-2 (6-6.5)	<0.06	185.93	<0.06	3.80	5.70	<0.025	<0.07	<0.06
EB-2 (15-15.5)	<0.06	9.33	<0.06	<0.06	1.49	<0.025	<0.07	<0.06
EB-2 (24.5-25)	<0.06	6.79	<0.06	2.26	3.02	<0.025	<0.07	<0.06
EB-3 (0-0.5)	58.57	434.26	<0.06	22.71	21832.67	0.141	<0.07	<0.06
EB-3 (2-2.5)	10.77	56.15	<0.06	4.23	4884.62	0.044	<0.07	<0.06
EB-3B (2-2.5)	<0.06	4.80	<0.06	3.20	6.40	<0.025	<0.07	<0.06
EB-3 (4-4.5)	9.27	76.06	<0.06	5.02	7335.91	0.082	<0.07	<0.06
EB-3 (6-6.5)	24.62	109.23	<0.06	11.15	12269.23	0.074	<0.07	<0.06
EB-3 (15-15.5)	<0.06	4.48	<0.06	1.87	2.61	<0.025	<0.07	<0.06
EB-3 (24.5-25)	<0.06	291.67	<0.06	4.76	3.97	<0.025	<0.07	<0.06
EB-4 (2-2.5)	<0.06	57.71	<0.06	2.37	54.15	<0.025	<0.07	<0.06
EB-4 (4-4.5)	<0.06	45.85	<0.06	2.77	284.58	<0.025	<0.07	<0.06
EB-4 (6-6.5)	<0.06	54.90	<0.06	2.75	97.25	<0.025	<0.07	<0.06
EB-4B (6-6.5)	<0.06	53.73	<0.06	3.92	372.16	<0.025	<0.07	<0.06
EB-4 (15-15.5)	<0.06	14.62	<0.06	4.74	3.16	<0.025	<0.07	<0.06
EB-4 (24.5-25)	<0.06	127.56	<0.06	8.27	22.05	<0.025	<0.07	<0.06
EB-5 (2-2.5)	<0.06	36.21	<0.06	4.12	1.65	<0.025	<0.07	<0.06
EB-5 (4-4.5)	<0.06	23.79	<0.06	4.44	10.48	<0.025	<0.07	<0.06
EB-5 (6-6.5)	<0.06	20.99	<0.06	2.29	3.82	<0.025	<0.07	<0.06
EB-5 (15-15.5)	<0.06	15.12	<0.06	1.55	<0.06	<0.025	<0.07	<0.06
EB-5 (24.5-25)	<0.06	3.94	<0.06	<0.06	<0.06	<0.025	<0.07	<0.06
EB-6 (0.5-1.0)	<0.06	12.55	<0.06	1.96	3.92	<0.025	<0.07	<0.06
EB-6 (2-2.5)	<0.06	5.98	<0.06	2.39	5.98	<0.025	<0.07	<0.06
EB-6B (2-2.5)	<0.06	9.92	<0.06	4.58	5.34	<0.025	<0.07	<0.06
EB-6 (4-4.5)	<0.06	7.06	<0.06	2.35	4.31	<0.025	<0.07	<0.06
EB-6 (6-6.5)	<0.06	5.10	<0.06	0.78	7.84	<0.025	<0.07	<0.06
EB-6 (15-15.5)	<0.06	13.44	<0.06	6.32	7.11	<0.025	<0.07	<0.06
EB-6 (24.5-25)	<0.06	146.46	<0.06	3.15	3.94	<0.025	<0.07	<0.06

Note: The sample name pre-fix "BH" that was used in the field and reported by the lab has been changed to "EB".